The Impact of Directed Mirror Focus and Technique Cues on Psychological, Cognitive and Emotional Exercise Correlates in an Introductory Weight Training Orientation

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ABSTRACT

The purpose of the study was to investigate whether teaching inactive and low active women to use mirrors for form and technique purposes could lessen the negative impact of mirrors on self-presentational concerns, affect, and self-efficacy. Eligible women (N = 82) underwent a one-on-one weight training orientation with a personal trainer. Participants were randomized into one of four experimental groups, each unique in the type of feedback (general or technique-specific) and the degree of focus on the mirror for technique reinforcement. Questionnaires assessed study outcomes pre- and post-orientation. Results indicated groups did not significantly differ on any post-condition variables, when controlling for pre-condition values (all p's >.05). All groups showed outcome improvements following the orientation. This suggests that during a complex task, a personal trainer who emphasizes form and technique can facilitate improvements to psychological outcomes in novice exercisers, independent of the presence of mirrors or directional cues provided.

Keywords: mirror, self-awareness, exercise-related outcomes, personal training, weight training.

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Chapter One: Literature Review

1.1 Physical Activity

It is well-documented that a regular regime of physical activity imparts significant health benefits, such as a decreased risk for anxiety and depression, increased self-esteem and body image and the prevention of disease (Martin Ginis, Burke, & Gauvin, 2007; Warburton, Nicol, & Bredin, 2006). Further, research has shown that a single bout of exercise can have positive acute effects on psychological outcomes such as mood, self-perceptions, stress and anxiety (Martin Ginis et al., 2007). The Canadian Physical Activity Guidelines state that to achieve health benefits, adults aged 18-64 years should accumulate at least 150 minutes of moderate-to-vigorous intensity aerobic physical activity (MVPA) per week, in bouts of 10 minutes or more (Canadian Society of Exercise Physiology [CSEP], 2014). However, according to the Canadian Fitness and Lifestyle Research Institute (CFLRI), Canadians are insufficiently active and are therefore unable to reap the wealth of health benefits associated with regular activity (CFLRI, 2009). In fact, based on physical activity data collected in 2014, only 15% of Canadian adults met the current guidelines for weekly MVPA, with a larger proportion of men (17%) meeting the guidelines compared to women (14%; Statistics Canada, 2014). Additionally, the proportion of moderately active women appears to steadily decrease across the lifespan, while the proportion of moderately active men remains fairly constant (CFLRI, 2009). Therefore, although physical inactivity is a serious public health concern among both men and women, it appears that women in particular struggle to initiate and maintain moderate physical activity levels across the majority of age groups (CFLRI, 2009).

Public health guidelines primarily focus on the promotion of physical activity through steady-state aerobic exercise (CSEP, 2014; Winett & Carpinelli, 2001). This enhances cardiorespiratory fitness and contributes to improvements in body composition (Warburton et al., 2006; Winett & Carpinelli, 2001). However, research demonstrates that resistance exercise training also has profound positive effects on the body (Winett & Carpinelli, 2001). Resistance training, or weight training, involves precise controlled movements for each major muscle group, which function to increase skeletal muscle strength, power, endurance and mass (CSEP, 2011). Throughout the remainder of the document, this type of training will be referred to as "weight training," for ease of understanding. Weight training is a form of physical activity, usually structured and planned, involving intense efforts against a resistance. Most weight training activities provide resistance with free weights, like barbells, dumbbells, or the individual's own body weight, or by using weight machines. Weight training has been included in the Canadian Physical Activity Guidelines as a recommended part of one's physical activity regime in order to gain substantial health benefits (CSEP, 2011). The most recent guidelines state that muscle and bone strengthening activities using major muscle groups should be completed at least two days per week (CSEP, 2014). Based on an extensive review by Feigenbaum and Pollock (1999), it appears that most of the benefits of weight training can be acquired from two 15- to 20- minute sessions a week; therefore, weight training is a safe, relatively simple activity that takes minimal time. However, data from the 2004 National Health Interview Survey found that only 17.5% of women practice weight training the recommended two or more times per week (Arikawa, O'Dougherty, & Schmitz, 2011; Centers for Disease Control and Prevention [CDC], 2006). Further,

Statistics Canada (2013) reported that only 14.3% of women age 12 and older reported weight training at least once in the past three months; of those women who did weight train, they reported training an average of only 8.6 times in the past three months. Consequently, the vast majority of women are not receiving the extensive health benefits associated with weight training.

1.1.1 Benefits of weight training. There are a plethora of benefits to weight training, including improvements to the musculoskeletal system, maintenance of functional ability, increased strength and lean body mass and decreased body fat (Winett & Carpinelli, 2001). Additionally, weight training is associated with a decreased risk for certain diseases (e.g., osteoporosis), injury prevention, and improvements in body image and self-image (Doyne et al., 1987; Fahey, Insel, Roth, & Wong, 2013; Fleck & Kramer, 2014; Pollock et al., 2000; Winett & Carpinelli, 2001).

1.1.1.1 Physiological benefits. The gains in muscular strength that occur with weight training are often accompanied by improvements in body composition, and are attributed to changes in the size and make-up of the muscle fiber, and neuromuscular adaptations (Winett & Carpinelli, 2001).

1.1.1.1.1 Muscular strength and local endurance. Weight training improves muscular strength and endurance through physiological changes to muscle fibers, including small biochemical alterations and adaptations within the nervous system (Fleck & Kraemer, 2014; Fox, Bowers, & Foss, 1988; Nichols, Omizo, Peterson, & Nelson, 1993). One of the most prominent physiological adaptations to weight training is the enlargement of muscles (Fleck & Kraemer, 2014). This growth in muscle size is primarily due to muscle fiber hypertrophy; a state characterized by an increase in the size

of individual muscle fibers (Fleck & Kraemer, 2014). Muscle fiber hyperplasia, or an increase in the number of muscle fibers, is an additional adaptation to weight training that increases the size and strength of a muscle (Fleck & Kraemer, 2014). These adaptations can assist in muscular performance, athletic activities or simply ease the completion of everyday living (Fox et al., 1988).

1.1.1.1.2 Body composition and energy metabolism. Weight training is an effective way to increase energy requirements, decrease body-fat mass, and maintain an individual's metabolically active tissues mass (Campbell, Crim, Young, & Evans, 1994). In terms of body composition, studies have found that a consistent weight training regime can increase lean body weight and provide significant decreases in both relative and total body fat (Wilmore, 1973). Additionally, women in particular have demonstrated reductions in several anthropometric measurements following a 10-week weight training intervention, highlighting the improvements in the fat mass to fat free mass ratio that weight training can elicit (Fahey et al., 2013; Wilmore, 1973).

1.1.1.1.3 Disease prevention. It has been suggested that people who maintain or improve their strength and flexibility may be better able to perform daily activities and are less likely to develop physical impairments as they advance into older age (Braith & Stewart, 2006). Due to the strong inverse relationship between muscular strength and all-cause mortality, the American Heart Association, the American College of Sports Medicine, and the American Diabetes Association have recommended that weight training be included in one's regular exercise regime (Braith & Stewart, 2006). There is overwhelming evidence to suggest that weight training prevents declines in skeletal muscle mass and function, prevents osteoporosis, sarcopenia, lower-back pain, and

combats hypertension, dyslipidemia and obesity (Braith & Stewart, 2006; Feigenbaum & Pollock, 1999). For example, weight training has been shown to prevent age-associated fat gains and increase resting energy expenditure to ward off obesity, the leading preventable cause of death worldwide (Braith & Stewart, 2006; CDC, 2014). In terms of bone health, weight training provides weight-bearing stimulus to bone allowing for the improvement of bone density and the reduction of risk factors for osteoporosis (Friedlander, Genant, Sadowsky, Byl, & Gluer, 1995; Kelley, Kelley, & Tran, 2001; Layne & Nelson, 1999; Pruitt, Jackson, Bartels, & Lehnhard, 1992).

1.1.1.2 Psychological benefits. Recently, there has been increasing interest in the relationship between physical fitness and mental health. Psychological outcomes such as depression, anxiety, quality of life, mood, perceived stress and self-image concerns have all shown improvements following regular participation in weight training activities (Norvell & Belles, 1993; Ohira, Schmitz, Ahmed, & Yee, 2006; Williams & Cash, 2001).

1.1.1.2.1 Depression. Worldwide projections by the World Health Organization (WHO) identify unipolar major depression as the leading cause of disease burden for the year 2030 (WHO, 2013). Recent studies have found that more severe depressive symptoms are associated with significantly higher risk of all-cause mortality, including cardiovascular death and stroke (Lépine & Briley, 2011). Interestingly, women experience twice the rate of depression as men, meaning that an estimated one in eight women will contend with major depression in her lifetime (National Alliance on Mental Illness, 2009; National Institute of Mental Health, 2008). This mental health concern is on the rise globally, particularly for women, and represents a psychological state that can be targeted through weight training participation. In a study examining the effectiveness

of exercise interventions on depressive symptoms, women diagnosed with a depressive disorder were randomly assigned to an 8-week running (aerobic), weight lifting (non-aerobic) or wait-list control condition (Doyne et al., 1987). Results showed that both exercise conditions significantly reduced depression when compared to a control condition, indicating that weight training is an effective treatment option for clinical depression in women (Doyne et al., 1987).

1.1.1.2.2 Anxiety. Anxiety represents another serious public health concern that predominately affects women (WHO, 2014). A previous study examining the psychological benefits of a 4-month circuit weight training program found that subjects in the weight training condition displayed improvements in mood, decreases in somatization, anxiety, depression and hostility, compared to a control condition (Norvell & Belles, 1993). Results further indicated that subjects who dropped out of the training program experienced significantly greater feelings of anxiety compared to those who completed the program (Norvell & Belles, 1993).

1.1.1.2.3 Body image. In an experimental study examining the impact of weight training on body image variables, results indicated that individuals in the weight training condition reported significantly greater body satisfaction, reduced social physique anxiety, and enhanced physical self-efficacy, in contrast to a control group (Davis & Cowles, 1991; Williams & Cash, 2001). Additional studies have noted that following participation in a weight training intervention, female weight trainers reported significantly higher body cathexis (positive and negative feelings toward one's body; LaBat & DeLong, 1990) post-intervention (Tucker & Maxwell, 1992). A meta-analysis

by Campbell and Hausenblas (2009) found that weight training interventions have successfully led to significant improvements in body image.

1.1.1.2.4 Quality of life. Weight training has been shown to have beneficial effects on quality of life in certain special populations, such as breast cancer survivors. Over a 6-month weight-training program, physical global quality of life scores have been reported to improve from pre- to post-intervention (Ohira et al., 2006). Additionally, high-intensity weight training added to a cardiac rehabilitation program has been shown to improve quality of life parameters (Beniamini, Rubenstein, Zaichkowsky, & Crim, 1997).

1.2 Correlates of Exercise Behaviour

Exercise behaviour is influenced by a multitude of internal and external factors. These factors can determine exercise outcomes such as adherence and frequency of exercise participation. Understanding the factors that influence physical activity can aid in the development of more effective interventions, designed to increase the rate of regular exercise participation. Potential correlates of exercise behaviour have been widely studied and can be categorized into five groups: demographic and biological (e.g., age and parental weight status); psychological, cognitive and emotional variables (e.g., self-esteem, attitude, and perceived benefits); behavioural attributes and skills (e.g., previous physical activity and sedentary time); social and cultural variables (e.g., parental encouragement); and physical environment variables (e.g., access to facilities) (Sallis, Prochaska, & Taylor, 2000; Van der Horst, Paw, Twisk, & Van Mechelen, 2007).

1.2.1 Demographic and biological characteristics. The most consistently supported finding with regards to the correlation between demographic characteristics

and exercise participation is that men are more active than women across the lifespan (Sallis et al., 2000). Moreover, women are less likely to weight train, perhaps in part due to the common misconception that lifting weights will cause women to develop a bulky and masculine figure; characteristics typically associated with the male gender role (Dworkin, 2001). In addition, a negative association between age and physical activity has been consistently found, where physical activity levels decrease as age increases (Sallis et al., 2000; Scharff, Homan, Kreuter, & Brennan, 1999).

1.2.2 Psychological, cognitive and emotional variables. Accumulating evidence supports the belief that physical activity is associated with positive aspects of health and well-being. The following section will discuss the relationship between physical activity participation and psychological, cognitive and emotional variables.

1.2.2.1 Perceived self-efficacy. Self-efficacy broadly refers to an individual's confidence in his or her ability to engage in behaviours that will yield a desired outcome, even in the face of obstacles or barriers (i.e., "I am certain that I can weight train twice a week, even if there are time constraints"; Bandura, 1977; Sniehotta, Scholz, & Schwarzer, 2005). To date, there is strong evidence to suggest a positive association between self-efficacy and physical activity; greater feelings of self-efficacy are associated with greater physical activity participation (Rodgers & Sullivan, 2001; Van der Horst et al., 2007). In fact, self-efficacy is cited as the strongest and most consistent association with physical activity behaviour, when compared to all other psychological correlates (Sallis et al., 2000).

The growth of self-efficacy is a continuous process, evolving throughout life as people acquire new skills, experiences, and understanding. Bandura (1977) has identified

four major sources of self-efficacy; all of which will be discussed. The first and most potent source is mastery experiences. Performing a task successfully strengthens one's sense of self-efficacy in the same way that failing to adequately deal with a task or challenge can undermine and weaken self-efficacy. The second source is social modeling or vicarious learning. Seeing other people succeed, especially those who are similar to oneself, can raise feelings of self-efficacy. Third, receiving verbal encouragement, or social persuasion from others, helps people overcome self-doubt and focus on giving their best effort to the task at hand. Finally, physiological and emotional states can impact self-efficacy, where more positive emotional states are associated with greater self-efficacy. On the other hand however, if one interprets their physiological responses as negative, they will experience lower self-efficacy (e.g., a person who becomes extremely nervous before public speaking may report low self-efficacy in these circumstances; Bandura, 1977).

Within exercise settings, several types of self-efficacy have been identified. Coping, or self-regulatory self-efficacy, refers to an individual's confidence in his/her ability to perform an exercise task under challenging conditions (e.g., confidence in his/her ability to exercise while in a bad mood; Rodgers & Sullivan, 2001). Self-regulatory self-efficacy is most closely linked to adherence to an exercise program; the more confident an individual is in his/her ability to exercise under challenging conditions, the more likely he/she is to adhere to their exercise program (Rodgers & Sullivan, 2001). Task self-efficacy refers to an individual's confidence in his/her ability to complete the specific elemental tasks of an exercise (e.g., confidence in one's ability to run for 30 minutes; Rodgers & Sullivan, 2001). While self-regulatory self-efficacy is most closely

linked to exercise adherence, task self-efficacy is most important for the initiation of exercise behaviour; the more confident an individual is in his/her ability to perform the specific tasks involved in an exercise program, the more likely he/she is to begin exercising (Rodgers & Sullivan, 2001).

Task self-efficacy represents one of the mediating factors between people's intentions to change their health behaviour and the actual execution of the behaviour; a salient variable among a sedentary population (Sniehotta et al., 2005). In previous studies examining the gap between intention to exercise and adoption and maintenance of exercise behaviour, self-efficacy and outcome expectancies were found to be the most influential predictors of behaviour change (Sniehotta et al., 2005).

1.2.2.2 Enjoyment. Both quantitative and qualitative studies have shown enjoyment of exercise as an important factor in determining adherence to an exercise program (Wininger & Pargman, 2003). Studies have interviewed adherers and dropouts of a fitness program and found that significantly more adherers reported liking the activities of the fitness program (Wininger, 2002). McAuley and Jacobson (1991) followed women engaging in aerobic dance for eight weeks and found that good attenders enjoyed the class significantly more than poor attenders. It has been suggested that enjoyment of an activity not only ensures continued involvement, but also contributes directly to the psychological benefits of physical activity (Wininger, 2002).

1.2.2.3 Intention to exercise. Health behaviour theories such as the theory of reasoned action (TRA; Ajzen & Fishbein, 1980) and the theory of planned behaviour (TPB; Ajzen, 1991) emphasize the role of behavioural intentions as the most immediate and important predictor of behaviour. Intentions are explicit decisions to act in a certain

way, and they concentrate on a person's motivation towards a goal in terms of direction and intensity (i.e., I want to start running 5km, three times a week; Sniehotta et al., 2005). Once a behavioural intention is formed, the behaviour must be planned, initiated, maintained and restarted when setbacks occur (Sniehotta et al., 2005). Self-regulatory efforts are required to invest time and energy into the intended behaviour and work towards making it habitual (Sniehotta et al., 2005).

Studies have applied these theories to exercise behaviour specifically, and have found that exercise intentions are a strong predictor of regular physical activity; the greater the intention to be active, the greater one's participation in physical activity (Smith & Biddle, 1999). A study implementing a combined motivational (involving rational decision making procedures in which the individual evaluates the positive and negative consequences of engaging in exercise) and volitional (implementation intentions, involving the predecision of when, where and how the goal will be pursued) intervention found that participants receiving the intervention exercised more frequently and for longer duration, in comparison to a control group (Prestwich, Lawton, & Conner, 2003). Further, through implementation intentions, exercise behaviour is said to occur quickly, acquiring features of automaticity such as those found in habits (Prestwich et al., 2003). Once the behaviour has begun, implementation intentions have also been shown to protect goal pursuit (i.e., exercising three times a week) from distractions (Prestwich et al., 2003). Therefore, the higher people's intentions to exercise, the more likely they are to initiate and maintain exercise behaviours.

1.2.2.4 Body image. Negative body image is common in today's society, particularly among women. Regular exercise, and weight training in particular, has been

shown to improve one's body image and reduce self-presentational concerns (Campbell & Hausenblas, 2009; Frederick & Morrison, 1996; Leary, 1992). In a meta-analysis examining the impact of 57 exercise interventions on body image, results indicated that exercise interventions resulted in significant improvements in body image compared to control groups (Campbell & Hausenblas, 2009). Larger effect sizes were found in female compared to male populations, indicating greater improvements in body image among females post-exercise intervention (Campbell & Hausenblas, 2009). A study by Cash (2002) noted that exercise-induced changes in body weight, muscularity, physical competence and one's perceptions of their physical characteristics can all influence body image. For example, weight training can make exercisers feel stronger, thinner and more toned. These perceived physical changes have been found to elicit improvements in body image, further supporting the positive relationship between exercise, in particular weight training, and improvements to one's body image (Cash, 2002).

1.2.2.5 Self-presentation. Self-presentation, also referred to as impression management, is the process by which individuals attempt to monitor and control the impressions that others hold of them (Leary, 1992; Leary & Kowalski, 1990). The impressions people make on others have implications for how others perceive, evaluate, and treat them (Leary & Kowalski, 1990). Given the benefits associated with physical attractiveness in modern society, it is not surprising that self-presentational processes related to physical appearance are particularly prominent in many situations, including exercise (Focht & Hausenblas, 2004). Research examining the impact of self-presentational concerns on exercise participation has yielded mixed results. Self-

presentational concerns can both encourage and deter one from exercising, depending on which circumstance helps them maintain a favorable impression in others' eyes.

Research on the attractiveness stereotype shows that people form more positive impressions of attractive people compared to unattractive people (Leary, 1992). Regular physical activity has been shown to elicit improvements to one's appearance (i.e., reducing body fat/weight, increasing muscle mass); therefore, many people engage in exercise as a means of improving their physical appearance (Frederick & Morrison, 1996; Leary, 1992; Pearson, Hall, & Gammage, 2013). From a social identity perspective, some individuals may also regularly engage in physical activity so others will view them as an "exerciser" or an athletic person. Typically, being athletic is associated with a great deal of attention, praise and other social rewards (Leary, 1992). Therefore, people may choose to exercise to establish images of being physically active in others' eyes, thus reaping the wealth of societal benefits associated with this image.

However, other research has shown a negative relationship between self-presentational concerns and exercise frequency; those possessing higher self-presentational concerns may not exercise to avoid being seen as unattractive, unskilled or uncoordinated during exercise (Culos-Reed, Brawley, Martin, & Leary, 2002; Leary, 1992; Pearson et al., 2013). Aside from appearance-related concerns, individuals may be deterred from participating in activities if they possess a low skill level in those activities, particularly if the requisite skill is one most people of their age and social group should possess (Leary, 1992).

Given the salient role that self-presentation plays with respect to exercise behaviour, it is important to examine its specific affective and cognitive manifestations

(Pearson et al., 2013). Several specific self-presentational concerns have been linked to exercise behaviour, including social physique anxiety and self-presentational efficacy.

1.2.2.5.1 Social physique anxiety. When individuals doubt their ability to create the impression they are motivated to achieve, they may experience social anxiety (Akehurst & Thatcher, 2010). A specific type of social anxiety, social physique anxiety, refers to the distress associated with the perceived evaluation of one's body and physical appearance (Frederick & Morrison, 1996). The relationship between social physique anxiety and subsequent exercise behaviour has been extensively examined. Considerable research has shown that social physique anxiety, similar to self-presentational concerns, can function as both an incentive and a disincentive to exercise (Frederick & Morrison, 1996; Gammage, Hall, & Martin, 2004; Lantz, Hardy, & Ainsworth, 1997). Some results have indicated a negative relationship whereby individuals with higher levels of social physique anxiety are less likely to engage in physical activity, given the potential for their bodies to be evaluated negatively (Lantz et al., 1997; Martin, Leary, & O'Brien, 2001). This finding may be particularly true in those initiating an exercise program (Lantz et al., 1997; Pearson et al., 2013) and may represent a protective self-presentational tactic; similar to wearing concealing attire or standing away from the aerobics instructor (Brewer, Diehl, Cornelius, Joshua, & Van Raalte, 2004; Lantz et al., 1997). Alternatively, social physique anxiety has also been shown to have a positive relationship with exercise behaviour, as some people may exercise as a strategy to decrease self-presentational concerns about their bodies (Frederick & Morrison, 1996; Gammage, Hall et al., 2004; Pearson et al., 2013).

1.2.2.5.2 Self-presentational efficacy. Self-presentational efficacy is defined as an individual's level of certainty that he/she can make a favourable or desired impression on others (Gammage, Hall et al., 2004; Lamarche, Gammage, & Strong, 2009). Researchers have suggested that self-presentational efficacy and social anxiety vary inversely with one another, where self-presentational efficacy is thought to predict social anxiety (Gammage, Hall et al., 2004; Lamarche et al., 2009).

Self-presentational efficacy has demonstrated a positive relationship with exercise behaviour; greater certainty in one's ability to make a favourable impression on others is associated with greater exercise participation (Gammage, Hall et al., 2004; Gammage, Lamarche, & Drouin, 2014). For example, individuals who believe they can create impressions related to an exerciser - appearing fit, strong, or coordinated (high presentational efficacy expectancy) - will be more diligent with their exercise routines, particularly if they believe that exercise will maintain this impression (high outcome expectancy; Gammage, Hall et al., 2004). Alternatively, individuals who doubt their ability to present the image of appearing fit, strong, or coordinated (low presentational efficacy expectancy), or do not believe that they can achieve this image by participating in exercise (low presentational outcome expectancy), may decrease their exercise behaviour (Gammage, Hall et al., 2004). A study investigating the relationship between self-presentational efficacy and exercise behaviour found that increasing one's self-presentational efficacy was associated with higher intention to exercise (Gammage, Martin Ginis, & Hall, 2004). Additionally, a recent study found that self-presentational efficacy positively predicted moderate-vigorous physical activity in university aged men and women, providing further support for the positive relationship between self-

presentational efficacy and exercise behaviour (Gammage, Martin Ginis et al., 2004; Gammage et al., 2014).

1.2.2.6 Mood. Numerous studies have investigated the mood enhancing properties of exercise, noting that exercise can have a positive influence on one's mood state (Blanchard, Rodgers, Courneya, & Spence, 2002; Chmelo, Hall, Miller, & Sanders, 2009; Martin Ginis et al., 2007; Scully, Kremer, Meade, Graham, & Dudgeon, 1998). A meta-analysis confirmed that various forms of exercise, both aerobic and anaerobic, appear to be associated with an elevation of mood state, particularly among clinical samples (Scully et al., 1998). In a sedentary female population, a previous study found that six weeks of moderate exercise training was associated with improved general well-being, higher energy levels, and decreased state anxiety (Cramer, Nieman, & Lee, 1991). A review of the literature examining the link between physical activity and affect has supported the use of physical activity as a means of upgrading life quality through improved mood states (Fox, 1999).

Weight training in particular has been studied to examine its effect on mood/affect; participants have reported increased revitalization after weight exercise (Chmelo et al., 2009). More specifically, a dose-response relationship has been noted between exercise intensity and post-exercise affective response; moderate intensity (70% 10-RM) weight training generally yields the largest improvement in positive affective responses (Chmelo et al., 2009). Additional studies have suggested that low-to-moderate levels of aerobic exercise are better than traditional demanding (high intensity, long duration) exercise programs in terms of enhancing mood (Scully et al., 1998).

1.2.3 Behavioural attributes and skills. Variables such as activity history, alcohol, smoking and dietary habits are related to physical activity participation and adherence. Prior history of physical activity is positively related to future physical activity behaviour, as it promotes and shapes self-efficacy for exercise and aids in the development of physical activity skills (Sherwood & Jeffery, 2000). The observed relationship between exercise history and exercise behaviour varies, however, depending on how exercise history is defined. Recent exercise history is generally predictive of future exercise behaviour (Hagger, Chatzisarantis, & Biddle, 2001). Childhood exercise history, however, is inconsistently related to physical activity in adulthood (Hagger et al., 2001). One recent study found that recalling being forced or encouraged to exercise as a child was associated with lower levels of physical activity in adulthood (Sherwood & Jeffery, 2000).

Across a number of health risk behaviours, the strongest correlates of physical activity are smoking and diet (Bauman, Sallis, Dzewaltowski, & Owen, 2002; Sherwood & Jeffery, 2000). Smokers are generally less likely to be physically active and less likely to initiate an exercise program (Bauman et al., 2002; Sherwood & Jeffery, 2000). Additionally, active adults generally have healthier diets that are lower in fat content, compared with their sedentary counterparts (Bauman et al., 2002; Sherwood & Jeffery, 2000).

1.2.4 Social and cultural variables. Social support represents another robust correlate of physical activity. Individuals who engage in regular exercise report receiving more support from people in their home and work environments (Sherwood & Jeffery, 2000). Individuals who perceive their families as being supportive of their desire to

maintain good health are more likely to follow through with exercise intentions than those lacking social support (Sherwood & Jeffery, 2000). In a comprehensive review, six major sources of social influence on physical activity were identified: physicians or work colleagues, family members, exercise instructors or other in-class professionals, co-exercisers, and members of exercise groups (Sherwood & Jeffery, 2000). A sample of students reporting low levels of social support from either family or friends were 23-55% more likely to be insufficiently active for health benefits, compared to those who reported high levels of support (Trost et al., 2002).

1.2.5 Physical environment variables. Individual level influences such as exercise equipment at home, access to facilities, satisfaction with recreation facilities, and community level influences such as neighborhood safety, hilly terrain, and enjoyable scenery have all been noted to impact physical activity participation (Sherwood & Jeffery, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002). Previous studies have found that safe footpaths for walking and having easy access to a park were significantly associated with regular physical activity (Sherwood & Jeffery, 2000; Trost et al., 2002). More recent studies have found that physical activity is significantly lower among adults living in rural areas than in urban (Trost et al., 2002).

1.3 Factors Impacting Exercise-Related Cognitions and Emotions

Numerous personal and environmental factors can influence exercise-related cognitions and emotions. These include social (e.g., presence of other exercisers, sex of the instructor; Bray, Bassett, & Amirthavasar, 2011; Lamarche & Gammage, 2010; Martin Ginis et al., 2007) and environmental factors (e.g., presence of mirrors, one's position in the exercise classroom; Chmelo et al., 2009; Gammage, Martin Ginis et al.,

2004; Katula, McAuley, Mihalko, & Bane, 1998; Katula & McAuley, 2001; Lamarche et al., 2009; Martin Ginis, Jung, & Gauvin., 2003; Martin Ginis et al., 2007; Raedeke, Focht, & Scales, 2007).

1.3.1 Social environment factors. In addition to characteristics of the exercise stimulus (i.e., mode, duration, intensity), social-environmental factors (e.g., leadership style) can influence the quality of the exercise experience and psychological responses to exercise.

1.3.1.1 Factors related to the instructor. Literature in the field has discovered that exercise leaders are strongly influential individuals that possess the ability to effect participant exercise compliance (Franklin, 1986; Greenleaf, McGreer, & Parham, 2006). Specifically, personal trainers have the ability to provide knowledge, skills, guidance, support and motivation to assist their clients in reaching their full fitness potential, thus enhancing their client's quality of life (McClaran, 2003).

1.3.1.1.1 Health- or appearance-related class atmosphere. Raedeke and colleagues (2007) examined the impact of different exercise class conditions on affective outcomes. Volunteers participated in a single group-fitness exercise session in one of four conditions: the instructor created either an appearance or health-oriented focus, and they exercised either in the presence of a mirror or no mirror (Raedeke et al., 2007). Results revealed that participants in the health-oriented class reported more positive affective experiences and more enjoyment than those in the appearance-oriented classes (Raedeke et al., 2007). Mirrors did not appear to influence psychological responses in this sample of socially physique anxious females (Raedeke et al., 2007).

1.3.1.1.2 Instructor's clothing type. In terms of the manipulation of the instructor's clothing type, a study by Martin Ginis and colleagues examined the effects of exposure to physique-salient (i.e., instructor wore revealing attire that emphasized her thin and toned physique) and physique non-salient (i.e., instructor wore attire that concealed her physique) exercise videos and their influence on body image, self-presentational concerns, and exercise motivation (Martin Ginis, Prapavessis, & Haase, 2008). Results suggested that when women compared themselves less favorably to the instructor, regardless of her clothing, body image was negatively impacted (Martin Ginis et al., 2008).

1.3.1.1.3 Instructor's leadership style. Previous literature examined the effects of the group environment (enriched/bland) and group leadership style (enriched/bland) on social anxiety experienced by participants in a 40-min step aerobics class (Martin & Fox, 2001). Participants in the enriched group condition (i.e., social support, interactive, performance feedback provided to participants individually) reported significantly higher social anxiety than did those in the bland group condition (Martin & Fox, 2001). However, participants tended to have less social anxiety when the instructor used an enriched leadership style (i.e., pleasant, energetic, socially interactive) than when she used a bland leadership style (Martin & Fox, 2001).

1.3.1.2 Factors related to other exercisers. Consistent patterns of findings suggest that the presence of others can impact psychological responses such as exercise-induced feeling states (Martin Ginis et al., 2007; Raedeke et al., 2007). It appears that the presence of co-exercisers may induce a self-awareness process among novice female

exercisers, negatively impacting their exercise experience (Bray et al., 2011; Kruisselbrink, Dodge, Swanburg, & MacLeod, 2004; Lamarche & Gammage, 2010).

1.3.1.2.1 Gender of other exercisers. A study by Kruisselbrink and colleagues examined how an all-male, all-female, and mixed-sex exercise scenario affected participants' situational social physique anxiety, and the relationship of participants' situational social physique anxiety to immediate exercise intentions for each scenario (Kruisselbrink et al., 2004). More women indicated they would shorten their workout in response to the all-male versus all-female or mixed-sex exercise scenarios (Kruisselbrink et al., 2004). For all-male and mixed-sex scenarios, participants who intended to shorten their workout also tended to report higher situational social physique anxiety scores (Kruisselbrink et al., 2004). These results indicate that the presence of men in an exercise setting may trigger social physique anxiety in women, and that exercising in an all-female environment may have the least negative impact on women's exercise behaviours (Kruisselbrink et al., 2004).

1.3.1.2.2 Group environment. Participants exercising in an enriched group condition (i.e., interactive, social support and performance feedback provided to participants individually) reported significantly higher social anxiety post-exercise than did those in the bland group condition, demonstrating the impact of group dynamics/environment on psychological variables. The feedback provided in the enriched group condition was individualized to each participant, therefore, it is speculated that drawing explicit attention to the individual and their performance may elicit self-conscious emotions, accounting for this unexpected rise in social anxiety (Martin & Fox, 2001).

1.3.2 Physical environment factors. Recently, research in the body image field has begun to explore the effects of physical environment factors, such as the presence of mirrors in the exercise environment, on body image concerns, mood, enjoyment and self-efficacy, in women specifically. The following review will focus on the current body of literature on this topic, and will highlight the gaps in literature that should be explored through further studies.

1.3.2.1 Importance of mirrors. The American College for Sports Medicine (ACSM) has formulated guidelines to help interventionists adopt state-of-the-art practices for promoting more active lifestyles for our largely sedentary population. One guideline suggests that all exercise classrooms "should have mirrors on at least two of their four walls" (ACSM, 2012). These guidelines were specifically developed to aid exercisers in improving their form and maximizing the physical benefits of workouts (Martin Ginis et al., 2003). Therefore, the presence of mirrors in gym facilities serve as a public health initiative, designed to protect against injuries that improper form may otherwise cause.

1.3.2.1.1 Negative effect of mirrors. Several studies to date have examined the effects of exercising in front of a mirror on various psychological variables. These variables include: feeling states, self-efficacy, body image, self-presentation and social evaluative concerns.

A previous study examined sedentary women's feeling states and self-efficacy after exercising in a mirrored environment (Martin Ginis et al., 2003). Participants completed 20 minutes of moderate intensity exercise on a stationary bike in either a mirror or no mirror condition. Results indicated that women who completed their aerobic task in front of a full-length mirror experienced decreases in positive engagement,

tranquility and less of an improvement in revitalization than those in the no mirror condition. Overall, exercise performed in front of a mirror had a negative effect on participants' feeling states (Martin Ginis et al., 2003). Contrary to the hypotheses, all participants experienced an increase in self-efficacy from pre- to post-exercise, regardless of the presence or absence of a mirror (Martin Ginis et al., 2003).

A more recent study examined the potential confounding effect that the presence of other exercisers may have on individual's psychological states when exercising in the presence of a mirror. Researchers recruited sedentary women to complete 20 minutes of moderate intensity aerobic exercise on a stationary bike in one of four conditions: alone with a mirror, alone without a mirror, not alone with a mirror, not alone without a mirror (Martin Ginis et al., 2007). Results indicated that women in the not alone/mirrored condition experienced smaller increases in post-exercise revitalization compared to other conditions, and were the only participants to experience increased physical exhaustion (Martin Ginis et al., 2007). Women in the not alone/mirrored condition also engaged in more social comparisons and experienced greater self-consciousness when compared to all other conditions (Martin Ginis et al., 2007).

Another study examined perceived evaluative threat and state anxiety during exercise in women with high social physique anxiety (Focht & Hausenblas, 2004). Researchers recruited women who were non-or infrequent exercisers to complete a 20-minute bout of cycling in a naturalistic environment (i.e., presence of mirrors and other exercisers) and in a laboratory environment (i.e., no mirror, no other exercisers; Focht & Hausenblas, 2004). Results indicated that state anxiety increased significantly when the

women exercised in the naturalistic environment, which all women indicated to be more threatening than the laboratory environment (Focht & Hausenblas, 2004).

Finally, a study by Gammage and colleagues was designed to manipulate self-presentational efficacy in an exercise context and determine the effects of such a manipulation on social anxiety and social physique anxiety (Gammage, Martin Ginis et al., 2004). A sample of active females were recruited and told they would be participating in an aerobics class that would be videotaped, in clothing that would be provided for them (Gammage, Martin Ginis et al., 2004). Researchers randomized participants into either the low efficacy or high efficacy group (Gammage, Martin Ginis et al., 2004).

Individuals assigned to the low efficacy manipulation met at a dance studio which had mirrors across the entire front and back walls, and all windows left uncovered (Gammage, Martin Ginis et al., 2004). In addition, a video camera was set up in the front of a room and a male confederate was present with a second video camera (Gammage, Martin Ginis et al., 2004). Each participant was shown the set up of the room (i.e., presence of a male and video cameras), before being presented with the clothing to be worn during the upcoming aerobic session: spandex jog bra with short spandex shorts.

In the high efficacy manipulation, participants were taken to the same studio as the previous condition; however, all mirrors and windows were covered. Video cameras were set up at the front of the room but no male confederate was present. Provided clothing consisted of a loose fitting t-shirt and a pair of shorts. It is important to note that neither condition completed the aerobics class; they merely anticipated it and completed several psychological measures once provided with the information necessary to generate the high and low efficacy states (Gammage, Martin Ginis et al., 2004).

Results found that the low efficacy group scored higher on state social anxiety, physical appearance anxiety and social physique anxiety (Gammage, Martin Ginis et al., 2004). Participants in this manipulation group also scored significantly lower on the extent to which they were looking forward to the upcoming aerobics class (Gammage, Martin Ginis et al., 2004). Although the examination of the impact of mirrors on body image-related variables was confounded with several other potentially threatening factors, this study reveals information that can be extended into future studies. These results indicate that an exercise environment possessing high potential for evaluation (i.e., presence of mirrors and windows), leads women to experience greater feelings of anxiety and less motivation to pursue physical activity. However, not all studies examining the effect of mirrors on psychological outcomes have shown similarly negative outcomes.

1.3.2.1.2 Positive effect of mirrors. Katula and McAuley (2001) asked a sample of highly active women to perform 20 minutes of aerobic exercise in front of and in the absence of a full-length mirror. Results revealed that self-efficacy did not significantly change following exercise or recovery in the no mirror condition; however, women in the mirror condition showed moderate increases in self-efficacy post-exercise and large increases following a recovery period (Katula & McAuley, 2001). The authors suggested that the presence of a mirror during exercise may increase active women's perceptions of their capabilities (Katula & McAuley, 2001).

A more recent study examined the influence of mirrors on self-presentational efficacy and state social anxiety in a group exercise class in an active female undergraduate sample (Lamarche et al., 2009). Participants completed a 20-minute group step aerobics class either in a mirror condition or no mirror condition (Lamarche et al.,

2009). Regardless of the presence or absence of a mirror, self-presentational efficacy increased following exercise and state social anxiety decreased following exercise (Lamarche et al., 2009).

It appears that only one study in the mirror related literature has examined the impact of mirrors in a weight training setting. The purpose of this study was to examine female exercisers' affective responses following weight exercise both in the presence and absence of a mirror (Chmelo et al., 2009). All participants were asked to complete three sessions of weight training exercises, making personal contact with the experimenters only. During session one, a 10-repetition maximum (10-RM) was determined for seven different weight bearing exercises. For session two, participants were randomly assigned to either the mirrored or a non-mirrored environment and completed two sets of the seven weight exercises. Session three was counterbalanced so that the participant completed the exercise protocol in the other environmental condition. Researchers found that participants reported an increase in pleasantness and activation during and immediately following the completion of exercise in both exercise conditions (i.e., mirror and no mirror condition; Chmelo et al., 2009).

In looking at the studies examining the effect of mirrors on psychological outcomes in women, there appears to be one trend that can be extracted from the above results. Generally, the negative effects of mirrors appear to occur in inactive samples. In the one study with active women that suggested a negative effect of mirrors (Gammage, Martin Ginis et al., 2004), women did not actually engage in exercise, they only anticipated the exercise class. By contrast, exercising in the presence of a mirror appears to elicit positive psychological responses (e.g., improved mood, increased self-efficacy

and self-presentational efficacy, decreased social anxiety) among active women. One potential explanation for this difference is the way in which these groups of women use the mirrors. This contention is consistent with the theory of objective self-awareness (Duval & Wicklund, 1972).

1.3.3 Objective self-awareness theory (Duval & Wicklund, 1972). Objective self-awareness theory posits that any stimulus that causes focus on the self, such as the presence of an audience or looking into a mirror, can lead to a state of increased self-awareness (Duval & Wicklund, 1972; Martin Ginis et al., 2003; Martin Ginis et al., 2007). This state is characterized by a greater awareness of internal sensations and the elicitation of a self-evaluation process, whereby individuals compare themselves with the standard of correctness, or with the ideals that are salient in the situation (Duval & Wicklund, 1972). If the person is aware of a self-contradiction or a discrepancy between the actual and ideal self, negative self-evaluation and negative affect will occur (Duval & Wicklund, 1972). These negative psychological responses may be particularly prominent in the exercise setting where there is a blatant focus on appearance and many opportunities for social comparison and evaluation. Inactive women may be particularly prone to these self-awareness processes, as they may possess a more notable discordance between their actual selves and their ideal, exercising self (a self that would be highly salient in the exercise setting; Martin Ginis et al., 2003). Consistent with the theory, numerous laboratory studies have shown that gazing at oneself in a mirror increases self-focus and can lead to increased negative mood, particularly among women (Fejfar & Hoyle, 2000).

Several studies in the exercise field have supported this theory with respect to exercising in a mirrored exercise environment. For example, Martin Ginis and colleagues (2003) found that exercise performed in front of a mirror had a negative effect on participants' feeling states, a decrease in positive engagement, a tendency towards decreased tranquility, no change in physical exhaustion and only a small increase in revitalization. These results expand the tenets of objective self-awareness theory by suggesting that the presence of mirrors does not just effect feeling states while one is at rest but also effects feeling states that are induced by a bout of exercise (Martin Ginis et al., 2003). An additional study examining the effect of mirrored exercise environments and the presence of co-exercisers on sedentary women's exercise-induced feeling states found results consistent with objective self-awareness theory as well; women in the not alone/mirrored condition were more self-conscious about their appearance and engaged in more social comparisons (Martin Ginis et al., 2007). This suggests that increased self-awareness may be the mechanism underlying the decline in women's feeling states that were experienced after exercising in the presence of a mirror (Martin Ginis et al., 2007).

1.4 Limitations to Extant Literature

Despite the countless health-related benefits associated with weight training, women in particular are failing to meet the recommended guidelines for this type of exercise (Doyne et al., 1987; Pollock et al., 2000). One potential explanation for this lack of participation may be the evaluative potential associated with the exercise environment, and particularly the presence of mirrors in that environment.

Several studies have examined the impact of the presence of mirrors on psychological variables and feeling states during exercise in women. Although findings

have yielded mixed results, with some studies reporting negative effects after exercising in front of mirrors (Focht & Hausenblas, 2003; Focht & Hausenblas, 2004; Gammage, Martin Ginis et al., 2004; Katula et al., 1998; Martin Ginis et al., 2007; Martin Ginis et al., 2003), and others reporting positive effects (Chmelo et al., 2009; Katula & McAuley, 2001; Lamarche et al., 2009), it appears that negative effects are almost exclusively reported among samples of inactive women. In an attempt to explain this finding, Chmelo et al. (2009) suggested that active women, who are experienced exercisers, may use mirrors for technique reinforcement or performance feedback during weight lifting, subsequently mitigating any negative psychological outcomes that may result from the blatant focus on one's physical appearance. However, for inactive women (who are inexperienced exercisers), the mirrors may lead to a focus on physical appearance (e.g., weight and shape), leading to negative self-evaluations, as suggested by the theory of objective self-awareness (Duval & Wicklund, 1972). However, this contention has not been investigated in the literature. If this is the case, then directing non-exercisers' attention to the mirrors specifically to look at form and technique may be one way to reduce the self-evaluative process, and thus protect against the negative psychological effects of mirrors.

This study will address this limitation in the current literature, by verbally directing the participant's focus to their technique. To date, no studies have examined the impact of directed focus (i.e., "use the mirror to check your form") on psychological variables and affective responses in a low active or inactive female population. Further, the majority of studies in this field have examined this relationship while performing aerobic exercise (i.e., exercising on a stationary bike in front of a floor length mirror).

The single study that tested this relationship with weight training used a sample of regularly active women.

Chapter Two: Rationale, Purpose and Hypotheses

2.1 Rationale

Physical activity plays an important role in health, well-being and quality of life (CSEP, 2014). People who are physically active have been shown to live longer, healthier lives and are more likely to avoid illness and injury; thus physical activity offers a range of benefits for all ages and abilities (Warburton et al., 2006). Statistics have shown that despite the countless psychological and physiological benefits of regular physical activity, Canadians are insufficiently active and are failing to meet the Canadian Physical Activity Guidelines (CFLRI, 2009; CSEP, 2014). Women in particular struggle to initiate and maintain moderate physical activity levels across the lifespan (CFLRI, 2009). In fact, after adolescence, physical activity rates in women decline by 50.7% throughout the lifespan compared to a 47.9% decline reported in men, making women more susceptible to health-related consequences of inactivity (Haskell et al., 2007). Research has reported that physically inactive middle-aged women (engaging in less than 1 hour of exercise per week) experience a 52% increase in all-cause mortality, twice the cardiovascular-related mortality risk and a 29% increase in cancer-related mortality, compared with physically active women (Warburton et al., 2006).

The Canadian Physical Activity Guidelines describe the amount and types of physical activity that offer substantial health benefits to children, youth, adults and older adults (CSEP, 2014). Resistance training, or weight training, has been included in the guidelines as a recommended requirement of one's physical activity regime; adults aged 18-64 are encouraged to participate in activities that target muscles and bones at least two days per week (CSEP, 2011). There are many benefits to weight training, including

improvements to the musculoskeletal system, maintenance of functional ability, increased strength and lean body mass and decreased body fat (Fleck & Kraemer, 2014; Fox et al., 1988; Nichols et al., 1993). Additionally, weight training is associated with the decreased risk for certain diseases (e.g., osteoporosis), injury prevention, and improvements in body image and self-image (Doyne et al., 1987; Fahey et al., 2013; Fleck & Kramer, 2014; Pollock et al., 2000). Despite these benefits, statistics indicate that this is an exercise recommendation that women are failing to achieve. Statistics Canada (2013) reported that only 14.3% of women aged 12 and older reported weight training at least once in the past three months; of those women who did weight train, they reported training an average of only 8.6 times in the past three months.

One factor that may be particularly threatening to inactive women, potentially impacting their adherence to an exercise program, is the presence of mirrors (Focht & Hausenblas, 2004; Martin Ginis et al., 2003; Martin Ginis et al., 2007). Findings from previous studies investigating the impact of mirrors in the exercise environment have reported inconsistent results; studies examining samples of active women have found that mirrors improve feelings of mastery and self-efficacy (Chmelo et al., 2009; Katula & McAuley, 2001; Lamarche et al., 2009); however, studies investigating samples of inactive women have found that mirrors led to negative affect and poor body image outcomes (Focht & Hausenblas, 2003; Focht & Hausenblas, 2004; Gammage, Martin Ginis et al., 2004; Katula et al., 1998; Martin Ginis et al., 2007; Martin Ginis et al., 2003).

Chmelo et al. (2009) suggested that, for inactive women, mirrors may be a source of self-evaluation leading to negative affective states, while for active women, mirrors

may act as a source of performance feedback related to safety and technique. To date, however, no research has investigated whether using mirrors to emphasize form and technique, rather than appearance, is effective in reducing the negative impact of mirrors in inactive women.

Exercise leaders have the ability to moderate the potentially negative effects of mirrors. Specifically, personal trainers have the ability to provide their clients with the knowledge, skills, guidance, support and motivation they need to reach their full fitness potential and enhance their client's quality of life (McClaran, 2003). Thus, it is possible that personal trainers may be able to guide the focus of attention away from self-evaluation and towards technique in inactive women, perhaps lessening the negative impact of mirrors in this group. In fact, Chmelo et al. (2009) suggested that an introductory weight training session emphasizing the use of mirrors for technique purposes may help to desensitize the exerciser to mirror gazing, thus avoiding negative self-evaluations and negative affect (Chmelo et al., 2009).

This study filled an important gap in the literature. Specifically, it investigated whether instructing a novice exerciser to use the mirrors to focus on her form and technique could reduce the negative psychological consequences associated with exercising in a mirrored exercise environment. From a practical perspective, results from this study represent a potentially simple, fast and cost-effective way of reducing the negative psychological outcomes associated with mirrors in exercise environments. Furthermore, this study impacts the role of personal trainers (i.e., trainers may be required to alter the instructions they provide to clients) to ensure they are creating the most comfortable and positive weight-training environment for women.

2.2 Purpose and Hypotheses

The general purpose of this study was to investigate whether providing inactive or low active women with instructions for how to use a mirror to focus on form and technique could lessen the negative impact of mirrors on psychological outcomes. In this study, the instructions provided by the personal trainer in the presence or absence of mirrors were manipulated to examine their impact on self-presentational concerns, self-efficacy, feeling states, intention to exercise and enjoyment in a one-on-one weight training orientation in college-aged women. The specific hypotheses that were investigated were:

1. Following the training session, social physique anxiety would be lowest in the mirror present with mirror cues emphasizing technique condition, compared to the mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition.
2. Following the training session, task self-efficacy and self-presentational efficacy would be highest in the mirror present with mirror cues emphasizing technique condition, compared to the mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition.
3. Following the training session, revitalization, tranquility and positive engagement would be highest and physical exhaustion would be lowest in the mirror present with mirror cues emphasizing technique condition, compared to the mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition.

4. Following the training session, intention to exercise would be highest in the mirror present with mirror cues emphasizing technique condition, compared to the mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition.
5. Following the training session, enjoyment would be highest in the mirror present with mirror cues emphasizing technique condition, compared to the mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition.

Specific hypotheses regarding the no mirror present with technique cues condition were not made given the lack of previous research in this area. This study offered a very new perspective on the use of mirrors and technique cues in a personal training session. Therefore, it was unknown whether shifting an individuals' focus to the mirror for form and technique purposes would be a powerful enough tool to alter one's awareness completely. Perhaps the mere presence of a mirror is enough to elicit self-awareness processes, despite their helpful purpose. Therefore, given the uncertainty in this area of research, no hypotheses for the no mirror present with technique cues condition were made.

2.3 Assumptions

1. All participants were non-exercisers and beginners in terms of weight training experience.
2. All females were able to safely weight train.
3. All participants possessed the same view of the female ideal with respect to body shape and drive for thinness.

4. The trainer's verbal script was consistent across each participant of the same condition, and different between conditions, therefore making the focus of each group significantly different from one another.
5. The trainer's personality and exercise program (i.e., the 8 exercises completed) remained consistent from participant to participant, across every condition.
6. Participants were aware and behaved according to the verbal cues provided by the personal trainer, according to the specific manipulations of each condition.
7. The randomization process accounted for any variability between groups.
8. All participants were naïve to the true purpose of the study.
9. Participants answered questionnaires as honestly and accurately as possible.

Chapter Three: Methodology

3.1 Participants

A total of 84 inactive or low active women aged 17-25 years were recruited (21 randomized to the mirror present with mirror cues emphasizing technique condition, 22 randomized to the mirror present with technique cues but no mention of mirror condition, 20 randomized to the mirror present with general feedback but no technique cues condition, 21 randomized to the no mirror present with technique cues condition), as this group generally does not meet the minimum guidelines for weight training (CFLRI, 2009). In a study that looked at changes in feeling states following weight training in a mirrored or non-mirrored setting, effect sizes were generally large in magnitude (Chmelo et al., 2009). Based on a sample size analysis where power = 0.80 and $\alpha = 0.05$, approximately 20 women were required per experimental condition ($N = 80$; Cohen, 1992). A final sample size of 84 participants was therefore deemed adequate. Table 1 shows participant characteristics by condition. Approximately 68% of the sample was Caucasian, 12.2% were Asian (Chinese, Filipino and Asian), and the remainder of the sample were various ethnicities (African, Hispanic, Indian/Middle Eastern, Italian, Mixed, Belgian). Students varied in what year of school they were in; 32.9% in second year, 24.4% in fourth year, 19.5% in first year and 18.3% in third year. The remaining participants were graduate students or had recently graduated. Kinesiology students made up 24.4% of the women tested in this study, 17.1% were in Psychology, 12.2% in Concurrent Education and the remaining individuals were from several diverse programs across campus.

Recruitment for the study occurred by means of posters (see Appendix A) placed around Brock University, as well as through word-of-mouth and class announcements made across campus (see Appendix B for Verbal Script). Only volunteers reporting fewer than two bouts of moderate or vigorous exercise during a typical week were eligible to participate. Novice weight trainers were chosen for this study (i.e., those that had not regularly weight trained in the past year), to avoid any impact that prior experience may have had on study variables. Only women who could safely perform physical activity were considered for participation. Varsity athletes and those that reported having a clinical eating disorder were excluded from this study due to their unique characteristics related to body image and physical activity.

Table 1

Participant Demographic Characteristics by Condition

	Mirror present with mirror cues emphasizing technique (n = 20)		Mirror present with technique cues but no mention of mirror (n = 21)		Mirror present with general feedback but no technique cues (n = 20)		No mirror present with technique cues (n = 21)	
Variable	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	20.60	1.50	20.76	1.81	20.55	2.14	20.62	2.06
Weight (kg)	65.41	10.42	64.75	11.25	67.28	10.05	68.12	15.27
Height (cm)	164.10	7.05	163.85	6.21	165.12	6.67	163.39	6.21
Physical Activity	17.63	14.94	20.00	14.76	14.58	13.78	17.26	10.92
BMI	24.31	3.77	24.17	4.38	24.74	3.77	25.42	4.98
SPAS	2.88	0.71	2.95	0.76	3.09	0.79	2.85	1.07

Note. Physical Activity = moderate/vigorous physical activity, measured in METs/week; BMI = body mass index; SPAS = trait social physique anxiety; SD = standard deviation.

3.2 Measures

Participants completed a series of questionnaires to assess the outcomes of interest at three different time points: baseline, pre-test and post-test. Copies of all questionnaires can be found in Appendix C.

3.2.1 Baseline questionnaires. Baseline questionnaires included a demographic questionnaire, a leisure-time exercise questionnaire, the Physical Activity Readiness Questionnaire, and a trait body image measure.

3.2.1.1 Demographics. Participants were asked to self-report their age, year in school, major, ethnicity/race, weight training experience (e.g., have you ever weight trained? If so, when? Describe what you did, etc.), and the average number of times they engage in exercise per week. If the participant reported regularly weight training or engaging in 2 or more bouts of exercise equating to > 450 MET minutes/week, the research assistant spoke with the participant to gain more information regarding the types of exercises performed and at what frequency. Together with the principal student investigator, the research assistant determined whether the participant exceeded the physical activity limits or was an experienced weight trainer based on her responses. If she exceeded these criteria, she was thanked for her time and deemed ineligible for participation. The remaining demographic information was used to describe the basic characteristics of the sample of women tested.

3.2.1.2 Godin Leisure-Time Exercise Questionnaire (GLTEQ; Godin & Shephard, 1985). Participants' leisure-time exercise was measured using the GLTEQ. This 3-item instrument assesses the number of times a participant engages in more than 15 minutes of each of strenuous, moderate, and mild leisure-time exercise, in a typical 1-week period. Scores were calculated by multiplying weekly frequencies of strenuous, moderate, and light activities by known metabolic equivalents (METs) of nine, five, and three, respectively. Total weekly leisure activity was calculated in METs by summing the products of the separate components, to get a total value in METs/week, using the

formula below:

Weekly leisure activity score = (9 x Strenuous) + (5 x Moderate) + (3 x Light)

The reliability and concurrent validity of this questionnaire as a means of assessing leisure-time exercise has been found to be adequate among healthy adults (Godin & Shephard, 1985).

3.2.1.3 Physical Activity Readiness Questionnaire (PAR-Q; CSEP, 2002). Participants were required to complete the PAR-Q questionnaire prior to study participation, to ensure it was safe for them to begin physical activity. The questionnaire consists of 7 "yes" or "no" questions pertaining to one's health and medical history. If a participant answered "yes" to one or more of the questions, she was considered ineligible for participation; a "yes" on this questionnaire indicates the individual is unable to safely start an exercise program.

3.2.1.4 Trait Social Physique Anxiety Scale (SPAS; Martin, Rejeski, Leary, McAuley, & Bane, 1997). This scale assesses anxiety associated with one's body being evaluated by others (Hart, Leary, & Rejeski, 1989). The 9-item version of this instrument was administered, as it has been shown to have better psychometric properties than the original 12-item version (Hart et al., 1989; Martin et al., 1997). All items are measured on a 5-point Likert scale ranging from 1 *(not at all characteristic of me)* to 5 *(extremely characteristic of me).* For example: "It would make me uncomfortable to know others were evaluating my physique/figure." Items were reverse scored where required, such that higher scores indicated greater social physique anxiety. A mean score of all items was calculated. The 9-item SPAS has produced similar reliability coefficients as reported previously for the 12-item SPAS, demonstrating adequate internal consistency (Martin et

al., 1997). Additionally, the revised SPAS represents a unidimensional structure that is highly reliable and possesses sound construct validity (Katula et al., 1998). Cronbach's alpha showed adequate internal consistency reliability in the present sample ($\alpha = 0.91$).

3.2.2 Primary measures: Pre-and post-weight training session. The primary measures assessed the following state psychological responses before and after the weight training session: body image, self-presentation, self-efficacy and affect. Post-test measures were reworded slightly to reflect the exercise session undergone. Participants also completed measures of enjoyment, future intentions to exercise, and several manipulation checks following the weight training session only.

3.2.2.1 State Social Physique Anxiety Scale (S-SPAS; Kruisselbrink et al., 2004). This scale is a modified version of the 9-item SPAS (Martin et al., 1997), and is designed to capture situational social physique anxiety (Martin Ginis, Murru, Conlin, & Strong, 2011). Specifically, it assesses the degree of anxiety that an individual experiences at a particular moment in time, as a result of other people's evaluation of her physique (Kruisselbrink et al., 2004). For each of the items, participants indicate the degree to which the statement is characteristic of them, using a 5-point Likert scale ranging from 1 *(not at all characteristic of me)* to 5 *(extremely characteristic of me)*. Items were reverse scored where required such that higher scores indicated greater social physique anxiety and a mean score was calculated. The S-SPAS demonstrates acceptable reliability and validity (Martin Ginis et al., 2011). Cronbach's alpha showed adequate internal consistency reliability in the current study ($\alpha = 0.86$ for pre-state-social physique anxiety and, $\alpha = 0.89$ for post-state-social physique anxiety).

3.2.2.2 Self-Presentational Efficacy Scale (SPES; Gammage, Hall et al., 2004).

This scale assesses the extent to which participants are confident in their ability to present themselves favourably on five exercise-related impressions: (a) physically coordinated, (b) fit and toned, (c) having good stamina, (d) working out regularly, and (e) in good shape. Participants responded to each item on a scale ranging from 0% *(not at all confident)* to 100% *(completely confident).* An average score across all five items was calculated. This scale has demonstrated acceptable internal consistency, test-retest reliability and adequate validity and reliability among previous samples including college-aged women (Fleming & Martin Ginis, 2004; Lamarche, Gammage, Sullivan, & Gabriel, 2013). Cronbach's alpha in the current study showed adequate internal consistency reliability ($\alpha = 0.92$ for pre-state-self-presentational efficacy and, $\alpha = 0.93$ for post-state-self-presentational efficacy).

3.2.2.3 Task self-efficacy (TSE). A measure of task self-efficacy was generated for this study based on the items used in a study by Rodgers and Sullivan (2001). It assesses an individual's confidence in her ability to perform the elemental aspects of the weight training session (Rodgers & Sullivan, 2001). Items from the original scale were altered slightly to ensure they were specific and relevant to the present weight training session, as recommended by Bandura (1994). Participants were asked: "How confident you are that you can…" (1) perform all the required movements; (2) follow directions from the personal trainer; (3) use proper form/technique for each exercise; (4) complete the required number of repetitions for each exercise; and (5) successfully correct your form/technique. All items were rated on a 100-point scale ranging from 0% (*no confidence)* to 100% (*completely confident)*. The mean of the 5 items was calculated. In

the present study, Cronbach's alpha showed adequate internal consistency reliability (α = 0.89 for pre-state-task self-efficacy; α = 0.88 for post-state-task self-efficacy).

3.2.2.4 Exercise-Induced Feeling Inventory (EFI; Gauvin & Rejeski, 1993). This 12-item scale measures the degree to which respondents experience four distinct feeling states related to exercise: (a) revitalization, (b) tranquility, (c) positive engagement, and (d) physical exhaustion. Participants indicated the extent to which each item (e.g., "calm", "worn-out") described their current feeling state on a scale from 0 *(do not feel)* to 4 *(feel very strongly).* A mean score was calculated for each subscale. The EFI operationalizes a categorical approach to affect measurement, whereby four distinctive feeling states are assessed (Gauvin & Rejeski, 1993). Considerable research has indicated that feeling states that are particularly sensitive to the stimulus properties of physical activity are best represented categorically (Gauvin & Rejeski, 2001). Additionally, categorical measures are the preferred method for testing hypothesis in experimental designs, providing additional support for the use of the EFI in the present study (Ekkekakis & Petruzzelo, 2002). The EFI has shown good internal consistency and evidence of validity (Gauvin & Rejeski, 1993). Cronbach's alpha showed adequate internal consistency reliability in the present sample (αs ranged from 0.68-0.79 for pre-state-EFI subscales and 0.76-0.86 for post-state-EFI subscales).

3.2.2.5 Intention to exercise. Intentions are the proximal determinant of behaviour (Ajzen, 1991) and are assumed to capture the motivational factors that influence a behaviour; the stronger the intention to engage in a behaviour, the more likely should be its performance (Ajzen, 1991). Therefore, future intentions to participate in a weight training session were assessed following the training session only. The present

study utilized a similar behavioural intention scale as administered by DuCharme and Brawley (1995). Three intention statements reflecting a range of exercise frequencies from one to four times per week were presented to the individual for their evaluation. Participants indicated the degree of their agreement with each of the frequency statements on a 1-7 scale, from 1 *(extremely unlikely)* to 7 *(extremely likely)*. The 7-point graphic scale has been substantially justified as the optimal scaling method for belief and evaluation items (Ajzen, 1991). The final behavioural intention score was calculated from the mean of the three responses. Cronbach's alpha in the present sample showed adequate internal consistency reliability ($\alpha = 0.82$ for intention).

3.2.2.6 Enjoyment. Two items from the Physical Activity Enjoyment Scale (PACES) by Kendzierski and DeCarlo (1991) were used in this study. Participants were asked to rate how much they enjoyed the exercise session (i.e., I enjoyed it, it was a lot of fun) on a 7-point bipolar scale ranging from 1 *(no)* to 7 *(yes)*, such that 4 represented a neutral response. Higher scores on this scale reflect greater levels of enjoyment. An overall enjoyment score was calculated from the mean of the two responses. The original scale has demonstrated sufficient reliability, validity and internal consistency in a college sample (Kendzierski & DeCarlo, 1991).

3.2.2.7 Anthropometric measures. Body mass index was calculated as the ratio of actual weight (in kilograms) to height (in meters, squared) as assessed by the researcher, using a standardized, mechanical scale and stadiometer. These measures were taken, with shoes and socks off, to the nearest 0.1kg and 0.1cm to ensure consistency across the sample. All measures were recorded following the post-test questionnaires to

ensure that significant differences were attributed to the weight training session, as opposed to the measures of height and weight.

3.2.3 Manipulation checks. The following questionnaires were administered to assess the impact of the experimental manipulation on participants.

3.2.3.1 Awareness of training session focus. This manipulation check (see Appendix D) was used to ensure the participants were aware of the verbal cues being provided by the trainer, and to clarify whether they subsequently followed those cues (i.e., when the trainer told them to look in the mirror did they actually direct their gaze to the mirror). Two manipulation checks were developed: one for the three conditions in which mirrors were present (mirror present with mirror cues emphasizing technique condition, mirror present with mirror cues emphasizing technique condition mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition) and a second for the condition where mirrors were absent (no mirror present with technique cues condition). For all conditions, participants were asked to recall three specific instructions or pieces of feedback given to them by the trainer and indicate what they focused their attention on during the training session (from a list of options; see Appendix D). In the mirror conditions only (mirror present with mirror cues emphasizing technique condition, mirror present with mirror cues emphasizing technique condition mirror present with technique cues but no mention of mirror condition and mirror present with general feedback but no technique cues condition), participants were asked to indicate how frequently they looked in the mirror during the session.

3.3 Procedures

After obtaining ethics clearance from Brock University's Research Ethics Board (see Appendix E), eligible women were recruited to participate in an introductory weight training session for novice female weight trainers. The true purpose of the study was concealed to avoid subject-expectancy effects, where the research participants expect a given result that consciously or unconsciously affects their responses.

Individuals who were interested in participating emailed the principal student investigator. At this time, the participant was provided with a letter of information (see Appendix F) and inclusion/exclusion criteria to ensure she was eligible to participate. Any questions or concerns the individual had regarding details of the study were addressed at this stage. Once the participant's eligibility was confirmed and she was prepared to proceed with study participation, a mutually convenient date and time for participation was established. The participant was provided with the necessary details regarding the location of the study and the clothing to be worn, via email. All the testing occurred in the Exercise Intervention Lab, Welch Hall 16, on the Brock University campus. Participants were asked to arrive at the lab dressed in appropriate attire for physical activity. At this time, the researcher randomized the participant into one of the four conditions (mirror present with mirror cues emphasizing technique condition, mirror present with technique cues but no mention of mirror condition, mirror present with general feedback but no technique cues condition, no mirror present with technique cues condition). However, participants remained blind to this aspect of the study.

Upon arrival at the lab, the research assistant, not the principal investigator, greeted the participant, and ensured she was dressed appropriately for the upcoming

weight training session. Next, the assistant sat the participant down, facing away from the mirror and asked her to provide informed consent (see Appendix G) and complete the PAR-Q (CSEP, 2002). Exposure to the mirror only occurred once the weight training session had begun (in the three mirror conditions), to ensure significant results could be attributed to the use of the mirror during the exercise session alone. The assistant briefly looked over the contents of the PAR-Q to confirm that the participant was cleared for physical activity.

Participants next completed the demographic and physical activity questionnaires. The personal trainer (who was the principal investigator) remained in the lab during the completion of the initial questionnaires; however, she did not engage in any interaction with the participant.

Next, participants were asked to complete the SPAS followed by the state pre-test questionnaires. The order of presentation of the state questionnaires was randomized to prevent order-of-presentation effects. Following completion of these questionnaires, the trainer was formally introduced to the participant and they proceeded with the introductory training session, using the protocol associated with the participant's specific condition (see below). Following post-intervention state questionnaires, participants completed measures of enjoyment, intention to exercise and the manipulation checks. Finally, the participant was asked to remove her shoes for the measurement of height and weight.

Upon completion of all post-training measures, the primary investigator debriefed the participant on the true purpose of the study and provided an explanation for the use of deception in this investigation. The participant was encouraged to ask any questions so

the investigator could address these before she left. Next, the participant was asked to complete a re-consent (see Appendix H) form once made aware of the true purpose of the study, and thanked for her participation. Finally, she was provided with a copy of her weight-training program with the prescribed weight, repetitions and sets from the weight training session she had completed, for her future reference (see Appendix I).

3.3.1 Introductory weight training protocol. The following protocol was followed in each experimental session, based on guidelines from the ACSM (2010).

3.3.1.1 Warm-up. The personal trainer directed participants to walk briskly on the treadmill for 10 minutes as the warm-up segment. Safety functions (i.e., treadmill safety key) were addressed before the participant was permitted to begin using the equipment.

3.3.1.2 Weight training session. Following the completion of the warm-up, participants underwent the introductory weight training session components. The ACSM (2010) guidelines for exercise testing and prescription were adhered to throughout the weight training session. The session consisted of eight specific exercises targeting each of the major muscle groups. The order of exercises followed these guidelines, beginning with exercises involving the largest muscle groups, then working down to exercises involving the smallest muscle groups, beginning with upper body exercises then moving to lower body exercises (ACSM, 2010). For each exercise, the trainer explained what muscles would be targeted, described and demonstrated the exercise using proper form, then allowed the participant to perform it to ensure her safety and the use of correct technique. Given that the primary experimental manipulation of this study was the influence of task instructions on the effects of mirrors on psychological outcomes,

specific exercises that allowed the participant to view herself in the mirror at all times were chosen. The following exercises were performed: chest press, bent over row, bicep curl, triceps kickback, lateral dumbbell raise, body-weight squat, lunge and plank. The volume of weight used in each exercise was at the discretion of the participant, based on a recommended range provided to her by the personal trainer. The participant completed one set of 10 repetitions of each exercise, or to fatigue.

3.3.1.3 Exercise protocols. The Certified Professional Trainers Network (CPTN, 2005) regulations for proper exercise technique were adhered to. The participant was provided with the following instructions for each exercise.

3.3.1.3.1 Chest press. This particular exercise will be performed with resistance bands. Using a resistance band is an effective way to target the chest muscles, different from the traditional press with dumbbells. The band may make this exercise feel tougher, but you always have control over the level of tension by moving your hands closer or further away from the center of the band. With the band securely wrapped around the stationary bike behind you, stand with your back to the attachment and hold one handle in each hand. Position yourself far enough away from the attachment so that you feel tension on the bands. Begin with your hands next to your chest, with your elbows at shoulder level and palms facing the ground. While maintaining a stable core, exhale and fully extend the arms to push the handles out directly in front of you. Inhale and bring the handles back towards the chest, while controlling the elastic pull-back from the band. Pause slightly once the elbows reach a 90-degree angle. Exhale, push straight out in a subtle arc, until the arms are extended and the band handles are at the height of the

shoulder joint. Maintain a slightly bend elbow joint throughout the extension phase (avoid locking the elbows).

3.3.1.3.2 Bent over row. Place the dumbbell next to the bench once you have chosen an appropriate weight. Standing at one side of the bench, bend forward and place the inside hand and the inside knee on the bench. Adjust the hand in front of the knee so that the upper body is parallel to the floor with the spine in neutral alignment. Position the outside leg on the ground with slight bend in the leg. Keep the outside foot flat and stationary throughout the movement. Grasp the dumbbell with the outside hand, keeping the arm extended. Exhale, and begin the movement by squeezing your shoulder blades together, pulling the dumbbell up towards the rib cage at chest height. This should feel like you are trying to squeeze a pop can in between your shoulder blades. The elbow should be higher than the back and the forearm perpendicular to the floor. Keep the elbows close to the ribs. Pause, inhale and slowly lower the dumbbell to the start position. Make sure the arm is fully extended before beginning the next repetition. Upon completion of the set we will repeat the exercise on the opposite arm.

3.3.1.3.3 Bicep curl. Stand with the feet approximately shoulder width apart and the knees slightly bent. Keep the shoulders back and head up. Grasp the bar with a closed grip, palms facing forward, with the hands placed slightly wider than hip width. Have a slight bend in the elbows. The elbows remain stationary against the ribs with the upper arm perpendicular to the floor and "hugging" the body. Exhaling, flex at the elbow and curl the bar towards the chest. Pause, keeping the bar away from the shoulder. Keep the wrists in a neutral (straight) position throughout. Maintain an erect body position, and

avoid swinging through the hips or low back. Inhaling, lower the bar in a controlled manner to the starting position.

3.3.1.3.4 Triceps kickback. Place the dumbbell next to the bench once you have chosen an appropriate weight. Standing on one side of the bench, bend forward and place the inside hand and the inside knee on the bench. Adjust the hand in front of the knee so that the upper body is parallel to the floor with the spine in neutral alignment. Position the outside leg on the ground with slight bend in the leg. Keep the outside foot flat and stationary throughout the movement. Grasp the dumbbell with the outside hand, keeping your elbow at a 90-degree angle, arm hugged into the rib cage. Exhale and push the dumbbell back, keeping the upper arm stationary against the body, until the forearm is parallel with the body. Contract the triceps at the end of the motion. Pause, inhale and slowly bring the dumbbell back to the start position to complete one repetition. Upon completion of the set we will repeat the exercise on the opposite arm.

3.3.1.3.5 Lateral dumbbell raise. Stand with the feet shoulder width apart and the knees slightly bent. Grasp a dumbbell in each hand with a closed grip. Hold the dumbbells together in front of the body at arm's length with the palms facing inward. Maintaining a slight bend in the elbows, exhale and raise the dumbbells directly out to the side until the dumbbells are at shoulder level. Avoid swinging the body throughout the movement. Keep the dumbbells parallel with the floor with palms facing downward and wrists in a neutral position. Pause at the top of the movement, inhale and slowly lower the dumbbells back to the front of the body.

3.3.1.3.6 Body-weight squat. Start by standing up tall, with shoulders back, feet about hip-width apart and toes pointed slightly outward. Look straight ahead or slightly

upwards, while keeping the chest out. With all your weight on your heels, inhale as you initiate the exercise at the hip. Push the buttocks backwards and continue lowering until the thighs are parallel with the ground, as if you were sitting in a chair. Keep the chest out and eyes up throughout this movement. Maintain the weight in the heels throughout and ensure the knees remain behind the toes. The spine should remain flat throughout this movement (no curves). Pause slightly in the lowest position (legs at a 90 degree angle) and avoid bouncing. Initiate the up-phase by "pushing the floor away." Exhale through the sticking point. Maintain an erect body position; avoid inward/outward knee movements. Slow down the movement at the end of the repetition, and reposition if necessary for the next repetition. Avoid locking knees and keep abdominal muscles tight with the spine in neutral alignment. For added balance, bring your arms out in front of you as you lower.

3.3.1.3.7 Lunge. Stand erect, with feet approximately 6-12 inches apart. With the toes pointed straight, take one exaggerated step forward (approximately 1 meter) with the desired leg. Land on the heel of the lead foot while pivoted off the ball of the trailing foot. Keep the knees and feet aligned. Keep the head up, chest out and hips forward. Inhale while slowly flexing the lead leg, lower the trailing leg towards the ground. The lead leg remains directly over the ankle with the shin perpendicular to the ground. There should be no forward movement of the shin in the lead leg. Pause once the knee of the trailing leg reaches 2-4 inches above the floor. Exhaling, push off the forward leg until starting position is reached. Repeat the process with the opposite leg.

3.3.1.3.8 Plank. The plank is a core strengthening exercise that involves maintaining a static position for extended periods of time. The most common plank –

which we will perform today – is the front plank. This is where we hold a push-up position with the body's weight on the forearms, elbows, and toes. We will start this exercise by lying face down on the mat. Then prop your upper body up by placing your forearms on the mat, keeping your elbows under your shoulders and your arms parallel to one another. Place your legs shoulder width apart. Raise your body upward until it is parallel with the ground. Keep your head in a neutral position and toes curled under for support. Try to pull your belly button towards your spine to engage your core muscles. Hold position for 30 seconds. Exercise can be made more challenging by increasing the time interval.

3.3.1.4 Cool-down. The personal trainer explained to the participant that the cool-down portion is highly important as is allows their blood lactate levels to decrease more rapidly, promoting faster recovery from fatigue. It also helps prevent blood pooling by assisting in venous return, reducing the possibility of delayed onset muscle soreness and any tendency towards lightheadedness. The cool-down lasted approximately 5 minutes. The participant used the same cardiovascular modality that she selected previously during the warm-up period, however, at a reduced speed and intensity.

3.3.1.5 Flexibility training. The trainer took the participant through a range of stretches, targeting the muscle groups that were worked during the weight training session. The participant was encouraged to hold each stretch for 20-30 seconds to achieve a moderate workload, allowing 2-5 seconds of rest between each stretch. The trainer completed the stretches as well, to encourage the participant to follow her lead in terms of positioning and timing.

3.3.2 Experimental manipulation. Participants were randomized into one of four experimental groups for the assessment of study variables:

1. Mirror present with mirror cues emphasizing technique
2. Mirror present with technique cues but no mention of mirror
3. Mirror present with general feedback and no technique cues
4. No mirror present with technique cues

To ensure the experimental groups were significantly different from one another, the trainer adopted key words or phrases depending on the condition. For example, in the mirror present with mirror cues emphasizing technique condition, the trainer said, "Look in the mirror," followed by the appropriate technique cue pertinent to that exercise (e.g., "Make sure your knees do not pass over your toes when you squat," during the body-weight squat exercise). The same cues were used in the mirror present with technique cues but no mention of mirror condition and the no mirror present with technique cues condition, but without the instruction to look in the mirror. Participants in mirror present with general feedback but no technique cues condition were provided with vague verbal encouragement (see below). Each group went through the same warm-up, weight training, cool-down and stretching routine however, each group varied in terms of the degree to which they were asked to focus in the mirror and the verbal cues/feedback provided.

3.3.2.1 Mirror present with mirror cues emphasizing technique condition. Details regarding the experimental manipulation that was provided in the mirror present with mirror cues emphasizing technique condition are discussed below.

3.3.2.1.1 Weight training session. It is during the weight training session that the manipulation occurred.

The exercises were selected specifically so the participant could complete all the exercises in front of the mirror with a clear view of her body throughout. The trainer highlighted this at the beginning of the session by telling the participant that she would be situated in front of the mirrors for the entire weight training session so she could watch her form and technique at all times (e.g., "We are going to complete all the exercises today in this specific corner of the room – this way you have a clear view of yourself in the mirror, from both the front and the side. This is to ensure that you can watch and correct your weight training form and technique throughout the orientation, based on my instructions and feedback"). Before the participant began each exercise, the trainer explained the movements, demonstrated the exercise, assisted her in choosing appropriate weights and then asked her to try the exercise.

For this condition only, the trainer placed masking tape on the mirrors to assist the participants in completing the following exercises: the body-weight squat, lunge and the plank. Several lines of tape were placed on the mirror in each exercise to assist participants in determining how deep/far to sit down in the squat position (a horizontal piece of tape that indicated where their legs and buttocks should be at the bottom of the squat; the tape was placed at a different height each session depending on the participant's height), to ensure their knees did not pass over their toes during both the squat and the lunge (a vertical piece of tape to help them focus on keeping their knees and toes stacked), and finally to help participants maintain a neutral spine throughout the plank exercise (a horizontal piece of tape used to represent where their head, back and

buttocks should be to keep their back in a neutral, flat position; the tape was placed at a different height each session depending on the participant's height). The trainer provided cues such as: "Use the tape on the mirror as a goal for where you want your legs and buttocks to reach at the bottom of your squat. When you are in a seated position and your legs are parallel with the tape on the mirror, you have reached 90 degrees in depth." This further enforced the use of the mirror for form and technique purposes and increased the participants' awareness of their body and its positioning. The tape also provided a goal for the participant, motivating them to reach the point designated on the mirror.

Once the participant had begun the set, the trainer corrected her technique with specific mention of the mirror, and encouraged the participant to watch her form in the mirror. For example, "Look in the mirror. Make sure your arms are hugging your ears as you complete the triceps extension." If she was completing an exercise where the tape could be of use, the trainer would correct her technique with specific mention of the tape on the mirror: "Use the tape on the mirror as a guide, indicating how deep you should sink into the squat position." If the exercise was already being performed correctly, the trainer still encouraged mirror gazing as a means of reinforcing the proper technique: "Look in the mirror. Good work keeping your arm close to your body throughout the extension. Remember what that looks like for next time." Again, if the participant was completing an exercise where the tape could be of use, the trainer would make reference to the tape while reinforcing the proper technique: "See how your legs are parallel with the line of tape when you are at the bottom of the squat? That's correct; it means you're reaching 90 degrees."

Throughout the completion of each exercise (eight in total), the trainer told the participant to "look in the mirror" before providing her with a technique cue or correction that was pertinent to that exercise. For consistency, the trainer directed the participants view to the mirror twice during every exercise. To ensure the safety of the participant and to avoid any injuries, the trainer also asked: "How are the weights? Are you okay with the exercise? Do you need a break?"

3.3.2.1.2 Cool-down and stretch. During the flexibility training portion, the trainer continued to encourage the use of the mirror for proper stretch technique. For example: "Look in the mirror. Try to keep your back as straight and possible and hinge at the hips to try to touch your toes." Any questions or concerns that the participant had were addressed during the cool-down portion, allowing the trainer to effectively bring focus to the mirror throughout the stretch.

3.3.2.2 Mirror present with technique cues but no mention of mirror condition. Details regarding the experimental manipulation that was provided in the mirror present with technique cues but no mention of mirror condition are discussed below.

3.3.2.2.1 Weight Training Session. Participants were situated in the same corner of the room as the mirror present with mirror cues emphasizing technique condition to ensure they had the same opportunity to see themselves in the mirror. However, the trainer did not explicitly tell the participant to look in the mirror, as seen in the previous condition (e.g., "We are going to begin our orientation over here"). Before the participant began each exercise, the trainer explained the movements, demonstrated the exercise, assisted her in choosing appropriate weights and then let her try the exercise. Once the participant had started the set, the trainer corrected her technique with verbal comments

regarding her technique only, with no mention of the mirror. For example, “Make sure your arm is hugging your body as you complete the triceps kickback.” If the exercise was already being performed correctly, the trainer addressed the correct technique verbally with positive feedback: “Good work keeping your arm close to your body throughout the extension. That’s correct.” For each of the eight exercises, the trainer both corrected and reinforced performance by specifically mentioning the technique being used, to ensure the participant was aware of exactly how her body should be moving throughout the exercise. For consistency, the trainer made mention of form and technique twice during each exercise to ensure the manipulation was successful. To ensure the safety of the participant and to avoid any injuries, the trainer also asked: “How are the weights? Are you okay with the exercise? Do you need a break?”

3.3.2.2.2 Cool-down and stretch. During the flexibility training portion, the trainer continued to encourage the use of proper form and technique throughout each stretch. For example: “Keep your back as straight and possible and hinge at the hips to try to touch your toes.” Any questions or concerns that the participant had were addressed during the cool-down portion, allowing the trainer to effectively address proper technique throughout the stretch.

3.3.2.3 Mirror present with general feedback but no technique cues condition. Details regarding the experimental manipulation that was provided in the mirror present with general feedback but no technique cues condition are discussed below.

3.3.2.3.1 Weight training session. Participants were situated in the same corner of the room as the mirror present with mirror cues emphasizing technique condition and the mirror present with technique cues but no mention of mirror condition to ensure they had

the same opportunity to see themselves in the mirror. However, the trainer did not explicitly tell the participant to look in the mirror (e.g., "We are going to begin our orientation over here"). Before the participant began each exercise, the trainer explained the movements, demonstrated the exercise, assisted her in choosing appropriate weights and then let her try the exercise. Once the participant had begun the set, the trainer provided general positive praise when an exercise was performed correctly. For example, "Nice job, way to go." If the exercise was being performed incorrectly, the trainer addressed effort or enthusiasm to avoid any focus on technique. She said things like, "good effort, you're trying so hard or I wish I had your enthusiasm!" These comments strictly addressed effort and enthusiasm to ensure incorrect technique was not being reinforced. If it was possible for the participant to harm herself by doing an exercise incorrectly, the trainer was sure to stop the exercise all together and addressed the correct technique during the debriefing period. For consistency, the trainer made general feedback comments twice during each exercise to ensure the manipulation was successful. To ensure the safety of the participant and to avoid any injuries, the trainer also asked: "How are the weights? Are you okay with the exercise? Do you need a break?" During the debriefing and review of the program, the trainer reinforced correct form for all exercises.

3.3.2.3.2 Cool-down and stretch. During the flexibility training portion, the trainer continued to provide positive comments through each stretch. For example: "Wow, you're really good at this stretch!" Any questions or concerns that the participant had were addressed during the cool-down portion, allowing the trainer to effectively provide feedback throughout the stretch.

3.3.2.4 No mirror present with technique cues condition. Details regarding the experimental manipulation that was provided in the no mirror present with technique cues condition are discussed below.

3.3.2.4.1 Weight training session. In this condition, curtains covered all mirrors. Participants were positioned away from the covered mirrors to avoid any focus on the mirrored environment. Before the participant began each exercise, the trainer explained the movements, demonstrated the exercise, assisted her in choosing appropriate weights and then let her try the exercise. Once the participant began the set, the trainer corrected her form with verbal comments regarding her technique only, as seen in the mirror present with mirror cues emphasizing technique condition and the mirror present with technique cues but no mention of mirror condition. Thus, the specific cues regarding form and technique were consistent across these three conditions. For example, "Make sure your arm is hugging your body as you complete the triceps kickback." If the exercise was already being performed correctly, the trainer addressed the correct technique verbally with positive feedback: "Good work keeping your arm close to your body throughout the extension. That's correct." For each of the eight exercises, the trainer both corrected and reinforced performance by specifically mentioning the technique being used, to ensure the participant was aware of exactly how her body should be moving throughout the exercise. For consistency, the trainer made mention of form and technique twice during each exercise to ensure the manipulation was successful. To ensure the safety of the participant and to avoid any injuries, the trainer also asked: "How are the weights? Are you okay with the exercise? Do you need a break?" This condition served as the control condition in terms of the effect of the mirror, as it is was the only

manipulation where a mirror was not present. This helped to determine whether any significant results were due to the presence of mirrors, or the use of technique cues.

3.3.2.4.2 Cool-down and stretch. During the flexibility training portion, the trainer continued to encourage the use of proper form and technique throughout each stretch. For example: "Keep your back as straight and possible and hinge at the hips to try to touch your toes." Any questions or concerns that the participant had were addressed during the cool-down portion, allowing the trainer to effectively address proper technique throughout the stretch.

Table 2 provides a summary of the key manipulations used to differentiate each experimental condition.

Table 2

A Summary of the Experimental Manipulations Used in Each Condition

Condition	Focus of Session	Correct Form Cue	Incorrect Form Cue
Mirror present with mirror cues emphasizing technique	Shift participants' focus to mirror as a means of checking form.	Look in the mirror. Good work bringing your arms up to shoulder height.	Look in the mirror. Make sure you bring your arms up to shoulder height.
Mirror present with technique cues but no mention of mirror	Highlight correct and incorrect form.	Good work bringing your arms up to shoulder height.	Make sure you bring your arms up to shoulder height.
Mirror present with general feedback and no technique cues	Positive words of encouragement.	Nice work. Great job.	Good effort, you are trying very hard.
No mirror present with technique cues	Highlight correct and incorrect form.	Good work bringing your arms up to shoulder height.	Make sure you bring your arms up to shoulder height.

3.3.3 Trainer characteristics and qualifications. The primary student investigator for this study was the trainer for all four experimental conditions. This ensured consistency across all sessions. At the time of the study, she was 23 years of age,

weighed 125lbs., was 5’3” tall and was a MSc (Kinesiology) student. The investigator was a female Brock University graduate from the Medical Sciences (Honours) program in the Faculty of Applied Health Sciences. She was qualified through the Certified Professional Trainers Network as a Certified Personal Trainer (CPTN-CPT) and possessed Standard First Aid with CPR-C certification. Throughout all sessions, the trainer wore the same, typical personal trainer attire to eliminate any effects that clothing may have had on study variables (i.e., cropped yoga pants and a loose fitting long sleeved shirt).

3.3.4 Manipulation training. The principal student investigator underwent training to ensure the four conditions were significantly different from one another in terms of verbal cues, that her personality and enthusiasm were consistent across conditions, and that her performance was consistent within each condition. The protocol and script were developed with the faculty supervisor and were practiced by the student investigator until she felt comfortable and natural providing the cues in each condition. Once comfortable, the student investigator completed several practice sessions of each condition on a non-participant. This ensured that instructions were clear, that accuracy across conditions was attained and allowed the student investigator to practice appearing natural in the delivery of the comments. In addition, a checklist was developed to assess consistency and was used to ensure the trainer was accurate and consistent (see Appendix J). Practice sessions were repeated until a 95% consistency rate in each condition was achieved.

3.3.4.1 Checklist for consistency. This checklist confirmed that the investigator’s script remained the same throughout each participant randomized to the same condition,

and that the conditions were significantly different from one another in the cues provided. This measure listed each exercise and the appropriate cues that should be provided (see Appendix J). Additionally, it addressed the order of the weight training session components to ensure they proceeded in the same order each time. The research assistant monitored each session using the checklist, out of view of the participant.

3.4 Data Analysis

All data was analyzed using SPSS 20.0. Data were first screened for entry errors and checked to ensure the assumptions for the appropriate statistical tests were met. Next, manipulation checks were conducted prior to hypothesis testing.

3.4.1 Screening data. Before analyzing the data, it was screened for missing and inaccurate values by examining the frequencies of responses.

3.4.1.1 Missing data. Missing data was screened visually. For cases where data for an entire questionnaire was missing, the participant's data was not used for any analyses involving that questionnaire. Where specific items were missing, visual inspection determined the quality and pattern of missing items. This confirmed that any missing data was random in nature. If less than 5% of the data was missing and there was no consistent pattern, an appropriate series mean was used as a substitute for missing items.

3.4.1.2 Check for inaccurate values. A frequency count was conducted to ensure all values on the questionnaire items were plausible. If an implausible response was detected, the original questionnaire data was revisited and the correct value was substituted for the value originally inputted.

3.4.2 Calculation of subscale scores. For the Godin Leisure-Time Exercise Questionnaire, total weekly leisure activity was calculated in METs as described previously. Items were reverse scored where appropriate before running any analyses. Mean scores for each scale/subscale were calculated where appropriate (SPAS, S-SPAS, SPES, TSE, EFI, Intention, Enjoyment).

3.4.3 Univariate outliers. Outliers are extreme values that may distort the results of a statistical analysis. Potential outliers were identified by z-scores greater than ± 3.29 ($p < 0.001$, two-tailed test). Cases flagged as potential outliers were examined and if appropriate, were either deleted or the outlier's influence was reduced prior to further data screening.

3.4.4 Screening for assumptions of data analyses. All data was screened to ensure that it met the assumptions of the ANOVA. These assumptions include normality, homogeneity of variance, and linearity as well as additional assumptions of independence of covariate effects and homogeneity of regression slopes for the ANCOVA test.

3.4.4.1 Normality. The majority of statistical tests are based on the assumption that the data are normally distributed. Skewness and kurtosis scores were examined to ensure the distribution of scores was approximately normal (values near zero; Field, 2013). Values were converted to z-scores by dividing by their standard error: $\left(z_{skewness} = \frac{S-0}{SE_{skewness}}\right)$, $\left(z_{kurtosis} = \frac{K-0}{SE_{kurtosis}}\right)$ (Field, 2013). Resulting z-scores were compared against ±1.96; the value expected if skewness and kurtosis scores were not significantly different from zero (scores greater than ±1.96 indicate significance and thus, a violation of normality, $p < .05$; Field, 2013).

3.4.4.2 Homogeneity of variance. This assumption presumes that there is equal or similar variance across all groups for each independent variable. This was tested by calculating the F_{max} for each variable in each group. $F_{\max}$ is defined as the ratio of the largest cell variance to the smallest. If the sample sizes are relatively equal (within a ratio of 4 to 1 or less for the largest to smallest cell size), an $F_{\max}$ as great as 10 is considered acceptable (Tabachnick & Fidell, 2007).

3.4.4.3 Linearity. Linearity refers to a function or relationship that can be graphically represented as a straight line. Bivariate scatterplots by group for all possible combinations of variables were examined to test this assumption (Tabachnick & Fidell, 2007). If data are normally distributed and related in a linear fashion, the scatterplot would be expected to be oval-shaped.

3.2.4.4 Independence of covariate effects. The assumption states that the covariate should not be influenced by the condition. Independence of the covariate effects was controlled for by randomly assigning participants to the conditions. Meeting this assumption reduces within group error variance (Field, 2009).

3.2.4.5 Homogeneity of regression slopes. This assumption states that the relationship between the outcome variable and the covariate should be the same in each condition. Multiple ANCOVAs were run for each dependent variable, and the interaction term was assessed (dependent variable*covariate; post-test score*pre-test score). The interaction term is expected to be non-significant ($p > 0.05$) in order to meet this assumption (Field, 2009).

3.4.5 Manipulation checks. The following section discusses how manipulation check data was analyzed.

3.4.5.1 Randomization check. The demographic data (age, height, weight, physical activity, school major, race/ethnicity) was analyzed to ensure participants were effectively randomized into the four conditions. A series of one-way ANOVAs were conducted to ensure that participants in the four conditions did not significantly differ from each other on demographic variables (i.e., age, height, weight etc.), physical activity status, or trait social physique anxiety. Effective randomization is represented by a *p*-value of greater than 0.05 on all tests.

3.4.5.2 Awareness of training session focus. For question 1, participant responses were categorized into one of three categories: form and technique, mirror, general feedback/breathing. Results were tabulated by adding up the total number of cues mentioned under each category per participant by group. The number of cues for each category was summed by condition and divided by the total number of cues recorded by participants for that condition.

A chi-square statistic was calculated for question 2 to compare conditions based on the variable each participant indicated she focused her attention on the most. A one-way ANOVA was conducted for question 3 to determine if conditions statistically differed in terms of how frequently participants looked in the mirror.

3.4.5.3 Checklist for consistency. The research assistant recorded when the trainer accurately followed cues on the script and marked any missed cues or instructions as an error. Any additional unscripted cues, or instructions provided out of order were also be noted as errors. A total score was calculated as a percentage based on the checklist provided, which represented overall accuracy of the trainer for each session:

$Checklist\ for\ Consistency = 100 - \left[\left(\frac{missed\ cues + added\ cues}{total\ cues\ possible}\right) \times 100\right]$. Sessions below 95% were excluded from analysis.

3.4.6 Descriptive statistics and correlations. Means and standard deviations for all variables were calculated for each experimental manipulation. Bivariate correlations were calculated between all study variables to determine the strength and direction of the relationship between variables.

3.4.7 Hypothesis testing. In order to determine whether there were differences in post-manipulation state variables (i.e., state social physique anxiety, self-presentational efficacy, task self-efficacy, affect), a series of ANCOVAs were conducted. For each, the relevant pre-manipulation score served as the covariate, and the post-manipulation score served as the dependent variable.

Before testing the specific hypotheses, bivariate correlations were run to determine if the trait measures and BMI scores were significantly correlated with the dependent variables. If they were related, they were also used as covariates where appropriate. To determine if the different conditions were associated with different exercise-related outcomes, the following analyses were conducted:

1. To test the hypothesis that state social physique anxiety would be lowest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition , an ANCOVA was conducted. Condition represented the independent variable and post-task scores were the dependent variable. Pre-task scores were entered as the covariate. When the initial ANCOVA was

significant, three planned simple comparisons were carried out to determine any significant differences between the mirror present with mirror cues emphasizing technique condition versus each of the other two mirror conditions. A Bonferroni correction was used to control for Type I error.

2. To test the hypothesis that task self-efficacy and self-presentational efficacy would be highest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, two separate ANCOVAs (one for task self-efficacy and one for self-presentational efficacy) were conducted. Condition represented the independent variable and post-task scores were the dependent variables. Pre-task scores were entered as the covariate. When the initial ANCOVA was significant, three planned simple comparisons were carried out to determine any significant differences between the mirror present with mirror cues emphasizing technique condition versus each of the other two mirror conditions. A Bonferroni correction was used to control for Type I error.
3. To test the hypothesis that revitalization, tranquility and positive engagement would be highest and physical exhaustion would be lowest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, four separate ANCOVAs were conducted. Condition represented the independent variable and post-task scores were analyzed as the dependent

variables. Pre-task scores were entered as the covariate. When the initial ANCOVA was significant, three planned simple comparisons were carried out to determine any significant differences between the mirror present with mirror cues emphasizing technique condition versus each of the other two mirror conditions. A Bonferroni correction was used to control for Type I error.

4. To test the hypothesis that intention to exercise would be highest in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, an ANOVA was conducted. Condition represented the independent variable and intention scores were analyzed as the dependent variable. When the initial ANOVA was significant, three planned simple comparisons were carried out to determine any significant differences between mirror present with mirror cues emphasizing technique condition versus each of the other two mirror conditions. A Bonferroni correction was used to control for Type I error.
5. To test the hypothesis that enjoyment would be highest in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, an ANOVA was conducted. Condition represented the independent variable and enjoyment score was analyzed as the dependent variable. When the initial ANOVA was significant, three planned simple comparisons were carried out to determine any significant

differences between mirror present with mirror cues emphasizing technique condition versus each of the other two mirror conditions.

Chapter Four: Results

4.1 Data Analysis

4.1.1 Screening data. Before analyzing the data, it was screened for missing and inaccurate values by examining the frequencies of responses.

4.1.1.1 Missing data. There was a single case where data for an entire questionnaire was missing; the participant's data was not used for any subsequent analyses involving that questionnaire. Approximately five single items were missing for various participants. Visual inspection confirmed that missing data was random in nature. Less than 5% of the data was missing and there was no consistent pattern, therefore an appropriate series mean was used as a substitute for missing items.

4.1.1.2 Check for inaccurate values. Two implausible responses were detected. The original questionnaire data was revisited and the correct value was substituted for the incorrect value.

4.1.2 Calculation of subscale scores. Two items on the SPAS and two items on the pre- and post-S-SPAS were reversed scored such that higher scores represented higher levels of trait and state social physique anxiety respectively. Mean scores for each scale/subscale were calculated.

4.1.3 Univariate outliers. Two potential outliers were identified; one participant with a physical activity z-score of 3.84 and another participant with a weight z-score of 4.35. Both participants were deleted prior to further analysis as their physical activity and weight status did not conform to the eligibility of the sample of women tested in this study.

4.1.4 Screening for assumptions of data analyses. All data was screened to ensure the assumptions of the main analysis were met.

4.1.4.1 Normality. Means and standard deviations as well as skewness and kurtosis values were calculated to assess normality (see Table 3). The following variables were positively skewed: BMI, moderate-vigorous leisure-time exercise, pre-physical exhaustion and post-physical exhaustion. Post-self-presentational efficacy, post-task self-efficacy and enjoyment were negatively skewed. Transformations were performed on these variables to help achieve normality. As suggested by Tabachnick and Fidell (2007) and Howell (2007), square-root transformations were conducted on data showing moderately positive and moderately negative skewness, whereas logarithmic transformations were completed on data showing substantially positive or substantially negative skewness. The following variables were transformed using a square-root transformation: moderate-vigorous leisure-time exercise, and post-self-presentational efficacy. The following variables were transformed using a log transformation: BMI, pre-physical exhaustion, post-physical exhaustion, post-task self-efficacy, and enjoyment. Following all transformations, skewness statistics were all within the acceptable range of ±1.9, and data was normally distributed. For all subsequent data analyses, transformed data was used. For ease of interpretation, untransformed data is presented when means and standard deviations are reported.

Table 3

Descriptives for Dependent Variables by Condition

	Mirror present with mirror cues emphasizing technique condition		Mirror present with technique cues but no mention of mirror condition		Mirror present with general feedback but no technique cues condition		Mo mirror present with technique cues condition	
Variable	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*	*Mean*	*SD*
PRE SPA	2.65	0.63	2.74	0.81	3.00	0.77	2.72*	0.79
POS SPA	2.48	0.71	2.58	0.79	2.86	0.88	2.48*	0.87
PRE SPE	51.83**	15.03	46.48**	19.04	31.15**	17.85	45.57**	20.97
POS SPE	69.20**	13.63	60.52**	20.44	43.91**	21.10	58.94**	21.20
PRE TSE	80.04**	12.40	71.60**	15.80	63.75**	16.44	77.50**	14.48
POS TSE	94.75**	6.90	89.42**	12.61	83.72**	12.61	90.47**	10.70
PRE RV	1.75**	0.70	1.66**	0.83	1.10**	0.65	1.41**	0.72
POS RV	2.57**	0.85	2.43**	0.94	1.98**	0.86	2.50**	0.61
PRE TQ	2.80	0.69	2.22	0.74	1.97*	0.98	2.22	1.03
POS TQ	2.80	0.91	2.44	0.82	2.27*	0.89	2.21	0.77
PRE PE	2.27**	0.76	2.16*	0.75	1.88*	0.72	1.94**	0.69
POS PE	2.88**	0.69	2.55*	0.93	2.17*	0.70	2.51**	0.98
PRE PHY	1.07	0.63	0.84	0.79	1.07	0.88	1.24	1.15
POS PHY	0.83	0.49	0.98	0.79	0.87	0.73	1.13	0.83
INT	3.35	1.59	3.90	1.54	4.17	1.46	4.22	1.44
ENJOY	6.20	0.82	6.27	0.84	5.73	1.07	6.29	0.77

Note. SPA = social physique anxiety, ranges 1-5; SPE = self-presentational efficacy, ranges 0-100%; TSE = task self-efficacy, ranges 0-100%; RV = revitalization, ranges 0-4; TQ = tranquility, ranges 0-4; PE = positive engagement, ranges 0-4; PHY = physical exhaustion, ranges 0-4; INT = intention; ranges 1-7; ENJOY = enjoyment, ranges 1-7; PRE = Pre-test scores; POS = Post-test scores. Significant differences in pre-to-post measures within condition indicated by *$p < .05$, **$p < .01$

4.1.4.2 Homogeneity of variance. Sample sizes in this study were approximately equal ($n_1 = 20$, $n_2 = 21$, $n_3 = 20$, $n_4 = 21$); within a ratio of less than 4 to 1 for largest to smallest cell size (Tabachnick & Fidell, 2007). The homogeneity of variance assumption was met as F_{max} values ranged from 1.11 to 1.88.

4.1.4.3 Linearity. Bivariate scatterplots by group for all possible combinations of variables were examined. All scatterplots examining these relationships possessed an oval-shape. Therefore, the assumption of linearity was met.

4.1.4.4 Independence of covariate effects. All covariates (pre-task scores) were measured prior to the manipulation; they were not influenced by each condition. Additionally, participants were randomly assigned to each condition ensuring that the condition had no effect on the covariates. This assumption was met.

4.1.4.5 Homogeneity of regression slopes. The present study met this assumption as all interaction terms were non-significant for all dependent variables ($p > 0.05$).

4.1.5 Manipulation checks. This included a randomization check and a questionnaire designed to assess whether participants were aware of the verbal cues provided by the trainer. Additionally, we wanted to ensure that the conditions were perceived differently from each other, indicating the success of the experimental manipulation.

4.1.5.1 Randomization check. A series of one-way ANOVAs were conducted. Effective randomization was established for all demographic data (age, height, weight, BMI, physical activity), trait measures, and all pre-test measures with the exception of revitalization, tranquility, self-presentational efficacy, task self-efficacy; despite data

transformations, However, pre-test scores were entered in as covariates in the main analyses, which is thought to account for these group differences.

4.1.5.2 Awareness of training session focus. For question 1 where the participant was asked to recall 3 instructions/pieces of feedback given to them by the trainer in the weight training session, responses were categorized as described above. The percentage of cues reported under each category by condition is reported in Table 4 below.

Table 4

Frequencies of Types of Cues Reported By Group (%) According to Number of Cues Reported

Condition	Mirror	Form and Technique	Vague
Mirror present with mirror cues emphasizing technique condition	6.67%	81.67%	11.66%
Mirror present with technique cues but no mention of mirror condition	0%	74.19%	25.81%
Mirror present with general feedback but no technique cues condition	0%	87.93%	12.06%
No mirror present with technique cues condition	0%	91.38%	0%

Note. Percentages based on number of total cues recorded per group: Mirror present with mirror cues emphasizing technique condition = 60; Mirror present with technique cues but no mention of mirror condition = 62; Mirror present with general feedback but no technique cues condition = 58; No mirror present with technique cues condition = 58.

Question 2 of the manipulation check asked the participants to select the component they focused their attention on the most during the weight training session: form and technique, the trainer, their appearance or the equipment. Given that these

responses represent nominal variables where categories have no intrinsic ordering, a chi-square test was performed. A chi-square statistic is used to investigate whether distributions of categorical variables differ from one another (Howitt & Cramer, 2014). The initial chi-square was run comparing condition against the variable participants indicated they focused their attention on the most. Howitt and Cramer (2014) suggest that if more than 20-25% of expected frequencies are less than five, chi-square should not be used, as small expected frequencies invalidate the test. The initial chi-square indicated that 50% of the expected counts were below 5 (minimum expected count was 0.5). When this occurs, it is suggested to combine data from the categories that have low expected frequencies (Howitt & Cramer, 2014). Therefore, the following variables and their responses were collapsed: the trainer, your appearance, the equipment. The chi-square test was then repeated with responses coded as "1" if the participant said they focused their attention on form and technique the most during the weight training session, and coded as "2" for any other responses. Four cells (50%) still contained expected counts less than 5 with a minimum expected count of 2.20, therefore Fisher's exact test was used (Howitt & Cramer, 2014). Results revealed that conditions did not differ in what participants focused their attention on the most, two-tailed Fisher exact $p = .73$.

Question 3 asked participants to select how frequently they looked in the mirror during the weight training session. This item was measured on a 5-point scale ranging from 0 *(never)* to 4 *(always).* Means and standard deviations by condition were as follows: mirror present with mirror cues emphasizing technique condition ($M = 3.15$, $SD = 0.59$), mirror present with technique cues but no mention of mirror condition ($M = 2.38$, $SD = 1.02$), mirror present with general feedback but no technique cues condition

(M = 2.55, SD = 1.00). A one-way ANOVA revealed that conditions statistically differed in how frequently participants looked in the mirror (F(2,58) = 4.41, p = .25). Follow-up Bonferroni post-hoc analyses indicated those in the mirror present with mirror cues emphasizing technique condition (M = 3.15, SD = 0.59) reported looking in the mirror significantly more than those in the mirror present with technique cues but no mention of mirror condition (M = 2.38, SD = 1.02).

4.1.5.3 Checklist for consistency. An overall percentage correct score (# correct cues/instruction ÷ total possible instructions * 100) was calculated for each condition. Consistency was represented by 98.3% in mirror present with mirror cues emphasizing technique condition, 97.5% in mirror present with technique cues but no mention of mirror condition, 95.8% in mirror present with general feedback but no technique cues condition and 95.0% in no mirror present with technique cues condition. Previous studies utilizing a similar checklist have suggested that an accuracy of 90% or higher is adequate to ensure consistency was achieved between and within conditions.

4.1.6 Descriptive statistics and correlations. Means and standard deviations for all variables were calculated for each experimental manipulation. Significant differences in pre-post measures are indicated in Table 3. Bivariate correlations were calculated between all study variables to determine the strength and direction of the relationship between variables (see Table 5). Correlations between BMI, trait social physique anxiety and each dependent variable were calculated to identify potential covariates; these were entered in the main analyses when appropriate (see Table 6).

Table 5

Pearson Bivariate Correlations between Study Variables by Condition

Variable	1	2	3	4	5	6	7	8	9
1. PRE SPA	1	.60**	.18	-.03	-.37	.31	.33	.27	-.12
2. POS SPA	.73**	1	.01	.17	-.08	-.06	.44	.19	.18
3. PRE SPE	-.62**	-.72**	1	-.76**	.19	-.01	.02	-.15	.00
4. POS SPE	.53*	.71**	-.63**	1	-.33	.38	.29	.13	.18
5. PRE TSE	-.54*	-.39	.69**	-.44*	1	-.58**	.01	.16	.24
6. POS TSE	.30	.16	-.31	.28	-.57**	1	.26	.11	.18
7. PRE RV	-.40	-.43	.24	-.27	.19	-.39	1	.56**	.26
8. POS RV	-.35	-.47*	.30	-.31	.17	-.33	.84**	1	.26
9. PRE TQ	-.59**	-.40	.43*	-.30	.56**	-.57**	.67**	.49*	1
10. POS TQ	-.42	-.50*	.32	-.18	.36	-.26	.58**	.75**	.46*
11. PRE PE	-.30	-.21	.09	-.32	.25	-.51*	.74**	.54*	.52*
12. POS PE	-.18	-.25	.12	-.23	-.02	-.18	.80**	.77**	.49*
13. PRE PHY	.32	.33	-.26	.26	.11	.06	-.45*	-.50*	-.27
14. POS PHY	.23	.27	-.24	.37	-.10	.37	-.46*	-.54*	-.23
15. INT	.18	.15	-.48*	.24	-.48*	.54*	-.44*	-.53*	-.35
16. ENJOY	.21	.24	-.18	.43	-.02	.05	-.55**	-.42	-.27
17. BMI	.39	.38	-.30	.19	-.13	.04	-.20	-.04	-.22
18. PA	.12	.04	-.05	-.09	.26	-.08	-.08	.12	-.06

Note. Mirror present with mirror cues emphasizing technique condition values shown above the diagonal; Mirror present with technique cues but no mention of mirror condition values shown below the diagonal. SPA = social physique anxiety; SPE = self-presentational efficacy; TSE = task self-efficacy; RV = revitalization; TQ = tranquility; PE = positive engagement; PHY = physical exhaustion; INT = intention; ENJOY = enjoyment; BMI = Body Mass Index; PA = physical activity; PRE = Pre-test scores; POS = Post-test scores. *$p < .05$, **$p < .01$.

Variable	10	11	12	13	14	15	16	17	18
1. PRE SPA	.26	.33	.48*	.21	.02	-.21	.15	-.34	-.23
2. POS SPA	3.9	.18	.31	.04	-.07	.13	.11	.00	-.22
3. PRE SPE	.21	.22	.18	.35	-.05	.09	.48*	-.33	.31
4. POS SPE	-.08	.05	-.07	-.25	.26	-.09	-.20	.27	-.22
5. PRE TSE	.10	.01	-.02	-.03	-.23	-.06	-.19	.21	.01
6. POS TSE	.07	.08	.07	-.08	.10	.16	.16	-.24	-.02
7. PRE RV	.56**	.36	.42	-.22	-.03	-.06	.18	-.09	-.27
8. POS RV	.44	.29	.58**	-.34	-.40	-.43	-.02	-.19	-.54*
9. PRE TQ	.65**	.34	.32	-.49*	-.46*	.39	.04	.25	-.21
10. POS TQ	1	.44	.54*	-.41	-.32	.13	.18	-.06	-.49*
11. PRE PE	.31	1	.84**	.19	.14	-.26	.10	-.17	-.13
12. POS PE	.48*	.64**	1	.04	-.16	-.26	.17	-.26	-.25
13. PRE PHY	-.12	-.28	-.56**	1	.54*	-.31	-.12	-.05	.53*
14. POS PHY	-.11	-.44*	-.48*	.64**	1	-.26	-.09	-.11	.17
15. INT	-.33	-.17	-.31	.23	.44*	1	.16	.01	.21
16. ENJOY	-.19	-.63**	-.73**	.45*	.36	.05	1	-.61**	-.11
17. BMI	-.06	-.07	-.23	.32	.05	.06	.07	1	.37
18. PA	.18	-.15	-.18	.35	-.13	-.25	.28	.59**	1

Note. Mirror present with mirror cues emphasizing technique condition values shown above the diagonal; Mirror present with technique cues but no mention of mirror condition values shown below the diagonal. SPA = social physique anxiety; SPE = self-presentational efficacy; TSE = task self-efficacy; RV = revitalization; TQ = tranquility; PE = positive engagement; PHY = physical exhaustion; INT = intention; ENJOY = enjoyment; BMI = Body Mass Index; PA = physical activity; PRE = Pre-test scores; POS = Post-test scores. *$p < .05$, **$p < .01$.

Variable	1	2	3	4	5	6	7	8	9
1. PRE SPA	1	.81**	-.34	.42	-.19	.15	.02	-.24	-.49*
2. POS SPA	.86**	1	-.67**	.68**	-.35	.30	-.25	-.42	-.29
3. PRE SPE	-.53*	-.51*	1	-.81**	.51*	.02	.43	.36	.17
4. POS SPE	.54*	.63**	-.80**	1	-.26	.21	-.24	-.63**	-.00
5. PRE TSE	-.08	-.24	.42	-.45*	1	-.24	.46*	.01	.01
6. POS TSE	-.19	.03	-.23	.40	-.77**	1	-.11	-.23	.27
7. PRE RV	.24	.12	.17	-.12	.21	-.23	1	.34	-.03
8. POS RV	.13	-.11	.01	-.27	.51*	-.69**	.21	1	.20
9. PRE TQ	-.33	-.32	-.04	-.07	.13	-.02	.15	.41	1
10. POS TQ	-.09	-.010	.05	-.23	.31	-.24	.08	.54*	.45*
11. PRE PE	.12	.02	.08	-.28	.45*	-.51*	.58**	.61**	.43
12. POS PE	.12	-.08	.03	-.32	.26	-.66**	.31	.71**	.17
13. PRE PHY	.12	.18	-.15	.09	.32	-.26	-.19	.22	-.16
14. POS PHY	.12	.06	-.55*	.31	-.19	.02	-.42	.23	.20
15. INT	-.39	-.36	.21	-.18	-.13	.21	.17	-.31	.13
16. ENJOY	.11	.33	.05	.27	.01	.23	-.04	-.44*	-.16
17. BMI	.64**	.43	-.61**	.48*	.10	-.25	.12	.36	-.01
18. PA	.25	.16	.32	-.49*	.22	-.39	.37	.25	-.02

Note. Mirror present with general feedback but no technique cues condition values shown above the diagonal; No mirror present with technique cues condition values shown below the diagonal. SPA = social physique anxiety; SPE = self-presentational efficacy; TSE = task self-efficacy; RV = revitalization; TQ = tranquility; PE = positive engagement; PHY = physical exhaustion; INT = intention; ENJOY = enjoyment; BMI = Body Mass Index; PA = physical activity; PRE = Pre-test scores; POS = Post-test scores. *$p < .05$, **$p < .01$.

Variable	10	11	12	13	14	15	16	17	18
1. PRE SPA	-.38	-.21	-.36	-.24	.31	-.34	-.05	.37	-.02
2. POS SPA	-.26	-.38	-.53*	-.07	.44	-.06	.14	.42	.01
3. PRE SPE	.09	.31	.41	-.08	-.42	-.15	.02	-.27	.39
4. POS SPE	-.12	-.47*	-.55*	-.15	.41	.08	-.02	.28	-.37
5. PRE TSE	.07	.24	.22	.01	.18	-.35	.23	-.26	-.01
6. POS TSE	-.05	-.41	-.24	-.55*	-.35	.08	.14	.06	.47*
7. PRE RV	.07	.34	.43	-.30	-.14	-.37	.20	-.23	-.22
8. POS RV	.46*	.33	.63**	.15	-.44	-.24	-.19	-.24	.23
9. PRE TQ	.77**	-.04	.23	.09	-.42	.23	-.38	-.18	.25
10. POS TQ	1	.26	.43	.31	-.30	.14	-.27	-.18	.10
11. PRE PE	.60**	1	.64**	.26	-.08	.15	-.19	-.27	.00
12. POS PE	.45*	.70**	1	.07	-.34	.21	-.32	-.45*	-.08
13. PRE PHY	.35	.03	.08	1	.30	.32	-.21	-.03	-.02
14. POS PHY	.28	.02	.14	.57**	1	-.08	.27	.43	-.41
15. INT	-.33	-.20	-.34	-.18	-.10	1	-.18	-.09	-.11
16. ENJOY	-.37	-.34	-.74**	-.06	-.22	.30	1	.11	-.03
17. BMI	.02	.13	.18	.26	.41	-.00	.06	1	.12
18. PA	.24	.44*	.40	-.01	-.15	-.11	-.15	.06	1

Note. Mirror present with general feedback but no technique cues condition values shown above the diagonal; No mirror present with technique cues condition values shown below the diagonal. SPA = social physique anxiety; SPE = self-presentational efficacy; TSE = task self-efficacy; RV = revitalization; TQ = tranquility; PE = positive engagement; PHY = physical exhaustion; INT = intention; ENJOY = enjoyment; BMI = Body Mass Index; PA = physical activity; PRE = Pre-test scores; POS = Post-test scores. *$p < .05$, **$p < .01$.

Table 6

Pearson Bivariate Correlations between Potential Covariates and Study Variables

Variable	BMI	Trait Social Physique Anxiety
PRE SPA	.325**	.850**
POS SPA	.322**	.790**
PRE SPE	-.381**	-.471**
POS SPE	.295**	.392**
PRE TSE	-.029	-.308**
POS TSE	-.080	.122
PRE RV	-.106	-.025
POS RV	-.034	-.008
PRE TQ	-.064	-.300**
POS TQ	-.082	-.091
PRE PE	-.094	-.029
POS PE	-.142	-.035
PRE PHY	.168	.132
POS PHY	.223*	.087
INT	.016	-.134
ENJOY	-.063	.096

Note. SPA = social physique anxiety; SPE = self-presentational efficacy; TSE = task self-efficacy; RV = revitalization; TQ = tranquility; PE = positive engagement; PHY = physical exhaustion; INT = intention; ENJOY = enjoyment; BMI = Body Mass Index; PA = physical activity; PRE = Pre-test scores; POS = Post-test scores.*$p < .05$, **$p < .01$

4.2 Hypothesis Testing

In general, the conditions were perceived differently. In terms of the type of feedback participants recalled receiving in the weight training session, only participants in the mirror present with mirror cues emphasizing technique condition recalled being told to focus their attention on the mirror by the trainer. Therefore, the trainer was successful in emphasizing the use of the mirror for form and technique purposes in the mirror present with mirror cues emphasizing technique condition only. Participants in the no mirror present with technique cues condition were able to recall the highest number of form and technique cues compared to all other conditions. It appears the absence of a mirror was successful in absorbing the participants' attention almost entirely on form and technique. Further, 0% of the feedback provided by this condition was classified as "vague," which supports the use of this as our control condition. For these reasons it can be suggested that conditions were perceived significantly different from each other, the experimental manipulation was indeed successful and hypothesis testing can continue.

4.2.1 Hypothesis 1. To test the hypothesis that state social physique anxiety would be lowest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, an ANCOVA was conducted. Post-task social physique anxiety was the dependent variable and condition was the independent variable. Pre-task social physique anxiety scores, BMI and trait social physique anxiety were entered as the covariates, as bivariate correlations revealed that BMI and trait social physique anxiety were significantly correlated to post-social physique anxiety (see Table 6). Analysis

showed no differences between conditions in social physique anxiety ($F(3,75) = 0.39$, $p = .76$, $\eta_p^2 = .015$). BMI was a non-significant covariate ($p > .05$), whereas trait social physique anxiety was a significant covariate ($p < .05$).

Given the non-significant ANCOVA result, 4 paired samples t-tests were conducted to determine if there were any significant differences in pre-test to post-test scores for social physique anxiety within each condition. Results showed the only significant change was that those in the no mirror present with technique cues condition reported significant pre-test to post-test decreases in social physique anxiety (mirror present with mirror cues emphasizing technique condition $t(19) = 1.24$, $p = .23$, mirror present with technique cues but no mention of mirror condition $t(20) = 1.19$, $p = .25$, mirror present with general feedback but no technique cues condition $t(19) = 1.23$, $p = .24$, no mirror present with technique cues condition $t(20) = 2.41$, $p = .03$; see Table 3).

4.2.2 Hypothesis 2. To test the hypothesis that task self-efficacy and self-presentational efficacy would be highest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, two ANCOVAs were conducted. In the first ANCOVA, post-task self-efficacy was the dependent variable and condition was the independent variable. Pre-task self-efficacy was the covariate; bivariate correlations revealed no other potential covariates. Analysis showed no differences between conditions in task self-efficacy ($F(3,76) = 1.23$, $p = .31$, $\eta_p^2 = .046$). In the second ANCOVA, post-task self-presentational efficacy was the dependent variable and condition was the independent variable. Pre-task self-presentational efficacy, BMI and

trait social physique anxiety were the covariates, as bivariate correlations revealed that BMI and trait social physique anxiety were significantly correlated to post-self-presentational efficacy (see Table 6). Analysis showed no differences between conditions in self-presentational efficacy ($F(3,74) = 1.04$, $p = .38$, $\eta_p^2 = .041$). BMI and trait social physique anxiety were both significant covariates (ps < .05).

Given the non-significant ANCOVA results, two sets of separate paired samples t-tests were conducted to determine if there were any significant differences in pre-test to post-test scores for each variable within each condition. This test revealed that participants in all four conditions reported significant pre-test to post-test increases in both task self-efficacy (mirror present with mirror cues emphasizing technique condition $t(19) = 7.70$, $p < .001$, mirror present with technique cues but no mention of mirror condition $t(20) = 5.82$, $p < .001$, mirror present with general feedback but no technique cues condition $t(19) = 4.21$, $p < .001$, no mirror present with technique cues condition $t(19) = 5.69$, $p < .001$; see Table 3) and self-presentational efficacy (mirror present with mirror cues emphasizing technique condition $t(19) = 9.77$, $p < .001$, mirror present with technique cues but no mention of mirror condition $t(20) = 4.69$, $p < .001$, mirror present with general feedback but no technique cues condition $t(19) = 5.77$, $p < .001$, no mirror present with technique cues condition $t(19) = 5.77$, $p < .001$; see Table 3).

4.2.3 Hypothesis 3. To test the hypothesis that revitalization, tranquility and positive engagement would be highest and physical exhaustion would be lowest following the training session in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention

of mirror condition and the mirror present with general feedback but no technique cues condition, four ANCOVAs were conducted.

In the first ANCOVA, post-task revitalization was the dependent variable and condition was the independent variable. Pre-task revitalization was the covariate; bivariate correlations revealed no other potential covariates. There were no differences between conditions in revitalization ($F(3,77) = 0.79$, $p = .50$, $\eta_p^2 = .030$).

In the second ANCOVA, post-task tranquility was the dependent variable and condition was the independent variable. Pre-task tranquility was the covariate; bivariate correlations revealed no other potential covariates. Analysis showed no differences between conditions in tranquility ($F(3,77) = 0.63$, $p = .60$, $\eta_p^2 = .024$).

In the third ANCOVA, post-task positive engagement was the dependent variable and condition was the independent variable. Pre-task positive engagement was the covariate; bivariate correlations revealed no other potential covariates. Analysis showed no differences between conditions in positive engagement ($F(3,77) = 1.68$, $p = .18$, $\eta_p^2 = .062$).

In the fourth ANCOVA, post-task physical exhaustion was the dependent variable and condition was the independent variable. Pre-task physical exhaustion and BMI were the covariates, as bivariate correlations revealed that BMI was significantly correlated to post-task physical exhaustion (see Table 7). Analysis showed no differences between conditions in physical exhaustion ($F(3,76) = 0.80$, $p = .50$, $\eta_p^2 = .031$). BMI was a significant covariate ($p < 0.05$).

Given the non-significant ANCOVA results, four separate sets of paired samples t-tests were conducted to determine if there were any significant differences in pre-test to

post-test scores for each variable within each condition. These tests revealed that all conditions showed significant pre-test to post-test increases in revitalization mirror present with mirror cues emphasizing technique condition $t(19) = -4.95$, $p < .001$, mirror present with technique cues but no mention of mirror condition $t(20) = -6.96$, $p < .001$, mirror present with general feedback but no technique cues condition $t(19) = -4.45$, $p < .001$, no mirror present with technique cues condition $t(20) = -5.91$, $p < .001$; see Table 3), and positive engagement mirror present with mirror cues emphasizing technique condition $t(19) = -6.53$, $p < .001$, mirror present with technique cues but no mention of mirror condition $t(20) = -2.45$, $p = .02$, mirror present with general feedback but no technique cues condition $t(19) = -2.10$, $p = .05$, no mirror present with technique cues condition $t(20) = -3.74$, $p < .001$; see Table 3) and those in the mirror present with general feedback but no technique cues condition reported significant pre-test to post-test increases in tranquility ($t(19) = -2.10$, $p = .05$; see Table 3).

4.2.4 Hypothesis 4. To test the hypothesis that intention to exercise would be highest in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition, an ANOVA was conducted; bivariate correlations indicated no significant covariates. Intention was the dependent variable and condition was the independent variable. Analysis showed no differences between conditions in future intention to exercise ($F(3,78) = 1.41$, $p = .25$).

4.2.5 Hypothesis 5. To test the hypothesis that enjoyment would be highest in the mirror present with mirror cues emphasizing technique condition compared to the mirror present with technique cues but no mention of mirror condition and the mirror present

with general feedback but no technique cues condition, an ANOVA was conducted; bivariate correlations indicated no significant covariates. Enjoyment was the dependent variable and condition was the independent variable. Analysis showed no differences between conditions in enjoyment ($F(3,78) = 1.50$, $p = .22$).

Chapter Five: Discussion

The goal of the present study was to investigate whether providing inactive or low active women with instructions for how to use a mirror to focus on form and technique could lessen the negative impact of mirrors on psychological outcomes during a one-on-one weight training orientation. More specifically, it was hypothesized that social physique anxiety and physical exhaustion would be lowest following the training session in the mirror present with mirror cues emphasizing technique condition and that task self-efficacy, self-presentational efficacy, revitalization, tranquility, positive engagement, intention and enjoyment would be highest following the training session in the mirror present with mirror cues emphasizing technique condition, when compared to the mirror present with technique cues but no mention of mirror condition and the mirror present with general feedback but no technique cues condition. Results indicated that when working with a trainer one-on-one, none of the outcomes assessed were different than the no mirror present with technique cues condition. This finding suggests that, during a complex task, a personal trainer who emphasizes teaching proper form and technique can facilitate improvements to psychological outcomes in novice exercisers, independent of the presence of mirrors or the types of directional cues provided. Demographic characteristics describing the sample of women tested followed by a discussion of study findings can be found below.

5.1 Sample Characteristics

When examining the characteristics of the participants tested in this study, it appears that this group represented a typical sample of university women. Mean BMI was in the healthy range for the mirror present with mirror cues emphasizing technique, mirror present with technique cues but no mention of mirror and mirror present with

general feedback but no technique cues conditions (24.31, 24.17 and 24.74 respectively). Mean BMI for the no mirror present with technique cues condition was slightly overweight (25.42) according to guidelines from Health Canada (2012), although it was not significantly different than the other conditions. Based on physical activity data, participants in this sample were fairly inactive (M_{PA} = 17.63 METs/week for the mirror present with mirror cues emphasizing technique condition, M_{PA} = 20 METs/week for the mirror present with technique cues but no mention of mirror condition, M_{PA} = 14.58 METs/week for the mirror present with general feedback but no technique cues condition and M_{PA} = 17.26 METs/week for the no mirror present with technique cues condition). The ACSM and the American Heart Association recommend that adults aged 18-64 accumulate 450-750 MET/minutes of exercise per week (Haskell et al., 2007). When the present sample's data was converted to MET/minutes per week, it equated to 219-300 across conditions; substantially lower than the recommendations. Given that the purpose of the study was to investigate the manipulation in a sample of inactive or low active women, it appears we were effective in recruiting the desired sample of women.

5.2 Potential Explanations for the Lack of Group Differences

Although no differences were found between conditions, there are several potential explanations for these findings that apply generally across all variables. These will be outlined first, followed by additional explanations that apply to specific outcomes.

The complexity of the exercise should be considered when examining the findings of the present study in conjunction with previous literature. It is possible that in more complex activities, participants are simply not able to allocate attention to their appearance; rather, their focus is absorbed entirely by completing the movements

correctly and following instructions from the trainer. In a previous study where no differences were found across mirror versus no mirror conditions, participants completed a step aerobics class (Lamarche et al., 2009). This is a relatively complex activity that requires a variety of unfamiliar skills and movements to be coordinated with instructor directions, much like a weight training session (i.e., weight training involves coordinating movements, controlling contraction, proper breathing). Similarly, Raedeke et al. (2007) found that mirrors, either by themselves or with leadership style, did not negatively influence participants' psychological responses, when completing a group step aerobics class. In fact, 6 out of 6 studies where mirrors led to negative psychological outcomes employed simple tasks (i.e., cycling, walking or jogging), whereas 2 out of 3 studies where mirrors led to positive outcomes employed complex tasks (i.e., step class, weight training). Simple, familiar, repetitive tasks where there is little cognitive effort needed to perform the task may provide greater opportunity for women to focus on their appearance. Furthermore, those assigned to the mirror present with mirror cues emphasizing technique condition experienced additional task complexity given the use of tape. For three exercises in this condition, the trainer referred to strips of tape on the mirror as benchmarks for achieving a desired goal (i.e., body position), or to reinforce proper body alignment. This may have further complicated an already intricate task, absorbing additional attention resources with technique-related information.

This justification is consistent with objective self-awareness theory, where the primary assumption is that a person's awareness will either be directed internally or to the environment (Duval & Wicklund, 1972). Given that the majority of participants in all conditions reported focusing their attention on form and technique the most during the

session, their attention was consumed by performing the exercises properly, understanding proper use of the equipment, learning breathing techniques, and listening to the instructions provided by the trainer. Consequently, the participant may have used the mirrors for external information. This may have mitigated the negative outcomes commonly associated with the use of the mirror for self-evaluation purposes (Chmelo et al., 2009; Duval & Wicklund, 1972). These findings further suggest that when a participant completes unfamiliar and/or complex movements, their focus of attention may be absorbed primarily by the new task and the skills involved, with little attention available for appearance focus and self-evaluation processes. This would result in fewer negative (or more positive) psychological outcomes. By contrast, in simple and repetitive tasks (e.g., cycling) where participants do not have to be constantly thinking about the specific elemental tasks of the exercise while performing the task itself, they have more time to focus on themselves and their appearance; in a mirrored setting this may be even more pronounced.

Although each condition differed in terms of the experimental manipulation, the emphasis of all conditions was inevitably form and technique. In order to ensure the safety of all participants, the trainer demonstrated each exercise while simultaneously providing every participant with detailed instructions for how to perform exercises properly (i.e., form and technique-related instructions). Once the participant was taught how to properly perform each movement, she was given the opportunity to practice it herself. It was at this point that the trainer provided her with cues that were relevant to the specific experimental manipulation (e.g., directed mirror focus in the mirror present with mirror cues emphasizing technique condition, form and technique focus in the mirror

present with technique cues but no mention of mirror and the no mirror present with technique cues conditions, general feedback in the mirror present with general feedback but no technique cues condition). Therefore, although the trainer was successful in generating four distinct conditions, she still provided form and technique instructions at the beginning of every exercise. These instructions may have overridden the cues provided while the participant was completing each exercise.

Further, it is likely that this inactive group of women with no weight training experience within the last year entered the session hoping to learn the basics about weight training, consistent with the purpose of the study described during participant recruitment. By volunteering for the session in hopes of learning about weight training, it is likely participants entered the session already focused on form and technique. This was especially likely given participants were volunteering to participate in a study "examining the factors influencing learning in a weight training orientation for novice female weight trainers." If the participants believed their learning style was being examined and measured, they may have been additionally focused on performing the exercises correctly, in order to portray effective "learning." The attention that participants devoted to learning a new skill for which they possessed very little prior knowledge, while attempting to prove themselves as an effective learner, may have been more influential than the cues and direction provided by the personal trainer.

Furthermore, given that participants had little experience in the exercise setting, it is possible that simply engaging in a bout of exercise facilitated psychological benefits. For example, psychological outcomes such as depression, anxiety, quality of life, and mood, perceived stress and self-image concerns have all shown improvements following

exercise participation (Norvell & Belles, 1993; Ohira et al., 2006; Williams & Cash, 2001). In an experimental study examining the impact of weight training on body image variables, results showed that individuals in the weight training condition reported significantly greater body satisfaction, reduced social physique anxiety, and enhanced physical self-efficacy (Davis & Cowles, 1991; Williams & Cash, 2001). Numerous studies have investigated the mood enhancing properties of exercise, noting that exercise can have a positive influence on one's mood state (Blanchard et al., 2002; Chmelo et al., 2009; Martin Ginis et al., 2007; Scully et al., 1998). Thus, it is possible that by engaging in an acute bout of exercise, all participants in the present study reaped the substantial psychological benefits associated with exercise (e.g., lower social physique anxiety, more positive affect, greater feelings of self-efficacy), regardless of the types of cues provided by the trainer. This explanation is supported by the fact that most variables increased significantly pre-to post, across all conditions (see Table 3).

While the above points are applicable to each of the outcomes investigated, there are also specific discussion points regarding individual hypotheses below.

5.3 Hypothesis 1: Social Physique Anxiety

The present study found that within a personal training (one-on-one) setting, there were no differences between the groups in social physique anxiety, even after controlling for pre-test scores. This finding is contrary to the hypothesis; however, there are several possible explanations. First, participants were able to self-select their apparel. All participants were told to wear "appropriate exercise attire," prior to arriving for the session. The different types of clothing worn (e.g., shorts, fitted t-shirt, baggy sweatpants, sweatshirt) indicate that these instructions were perceived differently across participants. Choosing their own clothing allowed participants to implement coping strategies

designed to reduce appearance-related concerns. Previous literature has acknowledged that many young women use clothing as a way to manage social physique anxiety (Sabiston, Sedgwick, Crocker, Kowalski, & Mack, 2007). For example, individuals may wear tight, revealing clothing to highlight body parts they are comfortable with or wear baggy clothing to hide their shape, depending on mood and individual preference (Sabiston et al., 2007). Thus, participants likely wore clothing they were comfortable in, subsequently reducing their social physique anxiety; a process unrelated to the experimental manipulation (Crawford & Eklund, 1994; Kowalski, Mack, Crocker, Niefer, & Fleming, 2006; Leary & Kowalski, 1995; Sabiston et al., 2007).

Secondly, the trainer wore the same clothing in all conditions: cropped yoga pants and a loose fitting long sleeved shirt. In a study by Crawford and Eklund (1994), university females viewed two videos of a group aerobics class. In one class, participants wore attire that emphasized their physique; in the other class, participants wore shorts and t-shirts designed to deemphasize their physique (Crawford & Eklund, 1994). Analyses revealed that study subjects had a preference for the shorts and t-shirt attire video, and reported lower levels of social physique anxiety when watching this video (Crawford & Eklund, 1994). An additional study employing a similar manipulation found consistent results; when participants watched an exercise video containing "perfect-looking" exercisers, their self-presentational efficacy and task self-efficacy decreased significantly (Fleming & Martin Ginis, 2004). Although this study did not specifically address social physique anxiety, it further supports the negative self-presentational outcomes associated with viewing others in physique-salient clothing (Fleming & Martin Ginis, 2004). It appears that females prefer when other exercisers wear loose fitting clothing - the exact

type worn by the trainer in the present study. This may have prevented participants from experiencing the negative psychological pathway outlined above.

Finally, the trainer avoided emphasizing appearance or appearance-related motives for exercise (O'Hara, Cox, & Amorose, 2014). Results from a previous study examining the effect of emphasizing appearance versus health outcomes in an exercise class found that participants in the appearance-focused class reported more negative body image (i.e., greater state self-objectification; O'Hara et al., 2014).

It is noteworthy to compare the present study's findings to those of previous studies. Focht and Hausenblas (2003) examined state anxiety responses when low active females completed three bouts of cycling in a university fitness facility (with a mirror present and other exercisers), a private laboratory setting (no mirror or other exercisers) and a quiet rest control condition. Results indicated that state anxiety increased during exercise in the naturalistic environment, but no changes were reported when the participant performed the cycling bout in the other conditions. These results should be looked at critically however, given that there were additional elements in the naturalistic environment that may have contributed to social evaluations, over and above the presence of a mirror (i.e., presence of co-exercisers). The negative impact of social evaluation on a variety of outcomes was also found in study by Gammage and colleagues. Individuals assigned to the low self-presentational efficacy manipulation were told they would be exercising in a mirrored room while being videotaped by a male confederate and while wearing a spandex jog bra with short spandex shorts. Results indicated that women in low efficacy group scored higher on state social anxiety, physical appearance anxiety and social physique anxiety compared to women in a high self-presentational efficacy

condition. Women in the high self-presentational efficacy condition were told they would be exercising in a non-mirrored room while wearing shorts and a t-shirt. Again, the additional social-evaluative elements of this manipulation (male confederate, revealing clothing, videotaping) could have contributed to the negative outcomes, and therefore makes is difficult to determine the impact that the mirror itself had on self-presentational outcomes, independent of social evaluations.

5.4 Hypothesis 2: Task Self-Efficacy and Self-Presentational Efficacy

The present study found no differences in either task-self efficacy or self-presentational efficacy between the four conditions, contrary to the hypotheses. Considerable research suggests that an acute bout of exercise has a positive influence on a variety of psychological variables, including self-efficacy (Bozoian, Rejeski, & McAuley, 1994; Martin Ginis et al., 2007; Petruzzello, Landers, Hatfield, Kubitz, & Salazar, 1991; Warburton et al., 2006; Yeung, 1996). Thus, perhaps by simply participating in an exercise session, all participants' experienced increases in self-efficacy, regardless of the feedback the trainer provided. It is likely that for the inactive group of women in the present study, simply the act of physical activity was enough to enhance their confidence. Further, not only did women participate in an exercise session, but also they completed each exercise successfully. The trainer allowed each participant to practice the exercises until she was able to perform 10 repetitions correctly, a process that undoubtedly contributed to positive psychological responses across all conditions (McAuley & Blissmer, 2000). In essence, all women experienced mastery of the exercises, as evidenced by the significant increase in task self-efficacy across all conditions (see Table 3).

According to self-efficacy theory (Bandura, 1997), self-efficacy has been shown to be a powerful influence on individuals' motivation, achievement and self-regulation. It has been linked to numerous positive psychological outcomes including more positive affect, greater feelings of authenticity, optimism, perseverance and interpersonal skills (Costello & Stone, 2012; Schunk & Pajares, 2009). To date, there is strong evidence to suggest a positive association between self-efficacy and physical activity (McAuley, 1993; Rodgers & Sullivan, 2001; Van der Horst et al., 2007). In fact, self-efficacy possesses the strongest and most consistent association with physical activity behaviour, when compared with all other psychological correlates (McAuley & Blisser, 2000; Sallis et al., 2000). Thus, it appears that by exercising, the women in the present study all experienced an increase in their self-efficacy. Both theory and previous research support this observation.

Bandura (1977), a highly qualified researcher in the area of self-efficacy, has identified four major sources of self-efficacy. It is interesting to note that the most potent source of self-efficacy is mastery experiences; when a person performs a task successfully, they will experience improvements to their self-efficacy. Every participant in the present study was given the opportunity to perform the weight training tasks until she achieved success, regardless of the condition to which she was assigned. It is likely that reaching success in an activity for which they had little experience, facilitated improvements to self-efficacy across all conditions (see Table 3). The second way of creating and strengthening self-beliefs of efficacy is through the vicarious experiences provided by social models (Bandura, 1977). Seeing people similar to oneself succeed raises observers' beliefs that they too possess the capabilities to master comparable

activities required to succeed (Bandura, 1977). Watching as the trainer demonstrated each exercise could improve participants' feelings of self-efficacy, particularly if they perceived their traits were similar to the trainers (e.g., age, gender); in other words, watching the trainer, someone they perceived to be similar to themselves, could have led them to believe they too possessed the capabilities to achieve the task. Bandura (1977) also describes that people often seek proficient models that possess the competencies to which they aspire. It is possible that participants were motivated to present themselves as an exerciser, and felt that as a personal trainer, the trainer represented this favourable image to which they aspired. The third major source of self-efficacy is receiving verbal encouragement and social persuasion from others; factors that help people overcome self-doubt and focus on giving their best effort to the task at hand. The trainer in the present study was very positive and upbeat when interacting with each participant. After every exercise, the trainer provided relevant feedback framed in a positive way (e.g., try to hug your arms into your side during the bicep curl). The trainer's encouragement may have further contributed to overall improvements in self-efficacy. Finally, physiological and emotional states can impact self-efficacy, where more positive emotional states are associated with greater self-efficacy (Bandura, 1977). Perhaps it was the improvements in emotional states (affect) that facilitated improvements to self-efficacy in the present study. Table 3 illustrates that all conditions reported significant pre-to post improvements in revitalization and physical exhaustion, two outcomes indicative of positive affect. Thus, it appears that the present study tapped into all four of the major sources of self-efficacy, offering a strong theoretical explanation for the significant improvements in self-efficacy across all experimental conditions.

Results in the present study are consistent with those of Martin Ginis et al. (2003) and Raedeke et al. (2007), who investigated the effects of a mirrored exercise environment on changes in self-efficacy in sedentary and active women respectively. Participants in both studies experienced an increase in self-efficacy, regardless of whether the exercise was performed in front of a mirror or not. One potential explanation for this is that for sedentary or low active women, an acute bout of moderate-intensity exercise may act as a powerful source of mastery information that increases efficacy beliefs. In other words, sedentary women tend to have lower exercise efficacy beliefs to begin with, thus, any type of exercise participation is likely to enhance their confidence (Martin Ginis et al., 2003).

No differences were found in self-presentational efficacy across all conditions in the present study, contrary to our hypothesis. This is consistent with findings from a study by Lamarche and colleagues (2009), who examined the influence of mirrors on self-presentational efficacy and state social anxiety in a group exercise class. Researchers found that regardless of the presence or absence of a mirror, self-presentational efficacy increased. Lamarche and colleagues suggested that this improvement might have been due to the actual completion of exercise. Successfully completing an exercise class may serve as a source of mastery, allowing women to feel like they were exercisers, regardless of the presence of mirrors (Lamarche et al., 2009). That is, by finishing the class, or in the case of the present study, the weight training session, participants may have believed they successfully presented themselves as "an exerciser" (Lamarche et al., 2009). This would have enhanced their self-presentational efficacy regardless of the presence of mirrors or cues provided by the trainer (Lamarche et al., 2009). Given the similarities between the

present study and that of Lamarche and colleagues, it is probable that the same mechanisms occurred in the present study, offering a helpful explanation for these results.

5.5 Hypothesis 3: Revitalization, Tranquility, Positive Engagement and Physical Exhaustion

Contrary to the hypotheses, the present study found no differences in revitalization, tranquility, positive engagement and physical exhaustion between the four conditions, even after controlling for pre-task scores. This finding is consistent with Chmelo and colleagues (2009) who found that when participants completed a weight training session in both a mirror and a no mirror condition, participants reported increases in pleasantness and activation in both conditions. In the present study, revitalization and positive engagement increased significantly in all conditions.

One possible explanation for the improvements in affect across all conditions may be the intensity at which women worked. Previous studies have indicated a curvilinear dose-response relationship between exercise intensity and post-exercise affective response (Arent, Landers, Matt, & Etnier, 2005; Strickland & Smith, 2014), with moderate intensity (70% 10-RM; exercise that is difficult enough to pose as a challenge but not so difficult that it leads to pain, soreness and extreme fatigue) weight training yielding the largest improvement in positive affective responses (Arent et al., 2005; Strickland & Smith, 2014). In the present study, the trainer asked participants to choose a weight of moderate intensity; one that was heavy enough to feel the effort in the target muscle group, but not so heavy they could not complete the recommended repetitions properly. Perhaps it was the moderate intensity exercise that facilitated improved affect across all four conditions in the present study.

These results are contrary to those found by Martin Ginis et al. (2003, 2007) who found that more negative affective responses were reported when participants performed a stationary bike task in the presence of a mirror and co-exercisers. Again, the lack of task complexity, confounded with the presence of co-exercisers could have contributed to higher negative affect. Martin Ginis et al. (2007) found that participants reported engaging in more social comparisons regarding their fitness and appearance, which may have increased self-awareness and self-evaluation, negatively impacting their affect. The present study took place in a private lab setting, one-on-one with a personal trainer. Therefore, the lack of co-exercisers and protective nature of the setting may have decreased social-evaluation and overridden self-evaluation processes, improving affective responses. Objective self-awareness theory supports this finding; self-evaluation processes cause individuals to compare themselves with the ideals that are salient in the situation (Duval & Wicklund, 1972). In situations with other exercisers, these comparisons may be more likely, leading to more self-evaluations and negative affect (Duval & Wicklund, 1972).

5.6 Hypothesis 4: Intention

Contrary to the hypothesis, the present study found no differences in post-task intention scores between the four conditions. Only one study in the mirror literature to date has examined future intentions following an experimental manipulation (Raedeke et al., 2007). Consistent with the present study, these authors found no effect for mirrors on future intentions, although a health-oriented instruction style (versus appearance-oriented) was associated with higher intentions (Raedeke et al., 2007). Thus, mounting evidence suggests that the presence of mirrors may not be influential on exercise intentions.

It is worthy to note that Raedeke et al. (2007) also found that regardless of condition, affective responses, enjoyment and efficacy were related to future intentions. In the present study, intention was significantly correlated with task self-efficacy, revitalization, and positive engagement (see Table 5). It is likely that the psychological responses to exercise are a stronger determinant of future intentions than the verbal cues provided by the personal trainer or the presence of a mirror.

5.7 Hypothesis 5: Enjoyment

The present study found no differences in post-task enjoyment scores between the four conditions. This finding was contrary to the hypothesis. Only one study in the mirror literature to date has examined enjoyment following an experimental manipulation (Raedeke et al., 2007). This study also found that the presence or absence of mirrors was unrelated to enjoyment, although like intention, the health-oriented leadership style was associated with greater enjoyment than the appearance-oriented class (Raedeke et al., 2007). It appears that the type of leadership in these studies (personal training in the present study and health versus appearance oriented in the study by Raedeke and colleagues) were both able to override the negative effects of the mirror by deemphasizing appearance.

In addition, the majority of the participants in the present study had never had a session with a personal trainer in the past. Perhaps the opportunity to learn one-on-one in an area for which they lacked experience (i.e., weight training), combined with the individualistic approach of personal training, enhanced participants enjoyment of the experience, regardless of the experimental manipulation. Most participants were very open to asking the trainer questions and learning more about weight training. The

trainer's upbeat, encouraging and outgoing personality coupled with the non-threatening exercise environment (i.e., wore physique non-salient clothing, avoided appearance-related comments/motives) may have helped the participants feel comfortable, enhancing their enjoyment of the session.

It is interesting to note that although conditions did not significantly differ in terms of enjoyment scores, it appears they were trending in the right direction according to the hypothesis. No mirror present with technique cues condition reported the highest enjoyment scores, which may be attributed to the lack of mirror present. The lack of opportunity to engage in any self-evaluation processes may have heightened the enjoyment experienced in the session. It is particularly interesting to note that participants in the mirror present with general feedback but no technique cues condition reported the lowest enjoyment scores. In this condition, participants were simply provided with general encouragement such as "good job" when the exercise was performed correctly, and moved on to the next exercise if it was being performed incorrectly. The session was much less informative and lacked the positive reinforcement participants gained in the remaining three conditions. Perhaps with a larger sample size, these differences may have reached significance.

5.8 Limitations

While the findings of the present study offer a new perspective and helpful insight into the impact of directed mirror focus and technique cues on exercise-related outcomes in a physical activity setting, a few limitations should be considered. In terms of generalizability, findings from this study can only be applied to the sample of women tested. This includes females aged 17-25 who do not regularly exercise (<2 times per

week) and have not weight trained in the past year, those able to safely perform physical activity (by passing the PAR-Q), those with no history of a clinically diagnosed eating disorder and those who are not varsity athletes. This means that findings may not apply to more physically active individuals with greater weight training experience. It is also possible that other/additional self-presentational concerns (e.g., fear of negative evaluation) and other psychological outcomes (e.g., body dissatisfaction) may also be relevant in this setting, but were not investigated.

Given that the targeted sample for this study was beginner weight trainers with little experience in an exercise setting, it is likely that those possessing very low efficacy or high anxiety in this type of environment may have been unwilling to participate in the study. Similarly, individuals who were uncomfortable with their bodies may not have volunteered for the study, knowing their body would be a central focus of a weight training session. This means that those who volunteered may have entered the session with a level of comfort and confidence regarding their body, leaving them less subject to changes that the environment may have had on their psychological state. Therefore, findings should only be generalized to those with fewer body image concerns. It should be noted that Kinesiology was the highest represented program from which women were sampled. It is likely that this group of women would have been exposed to physical activity and gym settings through their classes, and therefore may possess a greater level of comfort in these settings.

As previously stated, a research assistant was present for every session to measure the trainer's consistency. It is important to note that six different female assistants helped with this project. Thus, although all research assistants stayed out of view of the

participant during the actual training session, it is possible that different individuals present at each session could have affected results (this variable was not controlled for across conditions). It should be noted however that there was no systematic pattern between research assistants and the conditions in which they were present for; all research assistants were present for every condition approximately equally. Further, they all received the same training and practice prior to data collection. In addition, the trainer, not the research assistant, interacted with the participant for the majority of the session. The trainer quickly formed a trustworthy bond with study participants, and helped them feel comfortable. Thus, it is unlikely that the varying research assistants accounted for the study results.

Further, the trainer ensured the session was low in evaluative threat. The protective nature of the session (i.e., private lab setting with no other exercisers present, encouraging trainer, little emphasis on appearance or evaluation) may have helped participants feel comfortable and accomplished, thus improving psychological responses. Perhaps the negative impact of mirrors was mitigated by creating an environment that was otherwise low in evaluative threat. Moreover, although the use of tape in the mirror present with mirror cues emphasizing technique condition was designed to heighten the form and technique focus of the session, it may have resulted in participants focusing their attention on the tape itself, diverting their attention away from the mirror. It is possible this manipulation also worked to reduce the evaluative potential of the session, given the redirection of attention away from mirrors or mirror gazing.

Given that all measures were self-report, there is the possibility for inaccurate or dishonest responses. Each participant was assured that her data was anonymous. Despite

all the efforts made to ensure participants answered questionnaires honestly, the possibility for inaccurate responses or answering in favor of social desirability is inevitable. Additionally, participants may have experienced some discomfort due to the sensitive or personal nature of the questions being asked. This may have deterred the participant away from answering honestly, for fear of revealing body-related concerns. It is also assumed that participants were blind to the true purpose of the study. At the end of every session, the participant was debriefed as to the true purpose and why deception was required to obtain the most accurate results. Although the researcher asked the participant to keep the true purpose of the study concealed from others, we cannot be sure if they maintained this agreement.

Lastly, it is possible that our sample size was too small to detect any differences. Although sample size calculations were based on findings from Chmelo and colleagues (2009) who reported a moderate effect size, their experimental manipulation and outcomes measured were different from the present study. Thus, it is possible that our predicted sample size was too small, and was therefore unable to detect any small differences in outcome variables.

5.9 Future Directions

Although the findings from this study did not reflect that which was hypothesized, it did successfully fill an important gap in the literature. Chmelo and colleagues (2009) suggested that the discrepancies found in the mirror literature may be a result of how inactive versus active women use the mirror. Specifically, they suggested that mirrored environments may be more threatening to novice exercisers and warrant consideration at the beginning of an exercise program (Chmelo et al., 2009). They suggested that:

> One possible solution may be to have an introductory training session that teaches the novice exerciser how to perform the exercises while emphasizing the use of mirrors for technique purposes and not for self-evaluation. Perhaps such a session would effectively desensitize the exerciser to mirror gazing or help to avoid objective self-awareness (p. 1072).

This study took the opportunity to address this potential solution to poor psychological outcomes reported when inactive women exercise in the presence of mirrors. This study was very preliminary in nature and explored new and novel concepts. Further research is needed to explore the impact of mirrors during weight training in other samples (e.g., overweight or older populations). Additionally, no studies in the mirror literature have examined the effect of mirror presence on psychological outcomes in males. Given that body image concerns, namely the "ideal," differs between males and females, it would be interesting to investigate whether males respond differently to the presence of mirrors, particularly in a weight training environment.

Future studies should examine the impact of this experimental manipulation in novice female weight trainers possessing low task self-efficacy upon entering the session. Perhaps individuals possessing low confidence in their ability to perform the specific elemental tasks of an exercise may utilize instructor feedback and mirror focus differently than those possessing moderate to high levels of exercise efficacy; as seen in the present sample.

Finally, future studies may consider examining the impact of mirrors in a group exercise class, where individuals are learning a complex task such as weight training. This may help researchers determine if individuals in a group environment use mirrors

differently than those in a one-on-one personal training session, particularly when performing a complex task. Perhaps those in a group exercise class are more apt to engage in social comparisons and thus, self-evaluation. In this case, teaching participants how to properly use the mirror for technique reinforcement and performance feedback may be more relevant, given the heightened evaluative potential that exists in a group environment. Thus, participants may be more likely to utilize the trainer's cues to mitigate the social comparisons they would have otherwise engaged in. Additionally, it may be more difficult for a group fitness instructor to offer the individualized support and encouragement, and the guarantee of reaching success that can be offered by a personal trainer. Results from future studies such as this may clarify where mirror cues may be most effective.

5.10 Implications

5.10.1 Implications for research. The present study offers future researchers a unique experimental manipulation that can be replicated in other exercise settings, such as a group environment or an exercise class where the instructor creates an appearance-oriented focus. These situations may possess more opportunities for social comparisons and self-consciousness, leading to self-evaluations that may be more sensitive to the influence of mirrors. It would be interesting to discover the usefulness of mirror cues under these circumstances.

The present study also solidifies the importance of having participants actually perform the exercise session, in order to gain the most accurate representation of the outcomes experienced. Considerable research suggests that an acute bout of exercise has positive influences on a variety of psychological variables (Bozoian et al., 1994; Martin

Ginis et al., 2007; Petruzzello et al., 1991; Warburton et al., 2006; Yeung, 1996). This remained true for the present study, as all four condition showed improvements on almost all of the outcomes measured following the orientation. Perhaps by completing an exercise class, the self-presentational concerns that can arise from the exercise environment are overridden. Exercise sessions that are imagined or anticipated do not capture the positive influences of actually exercising on psychological variables; therefore it is critical that these outcomes are looked at in the context of actual exercise.

5.10.2 Implications for practice. Although the hypotheses were not supported, the results of the present study have positive implications for weight training environments.

It is important that personal trainers and group fitness instructors are aware that they play an instrumental role in ensuring their clients leave the gym with improved psychological states, thus improving their adherence. For example, a class emphasizing health-related messages (e.g., let's get fit and healthy; Raedeke et al., 2007) led by a social enriched trainer (Martin & Fox, 2001), wearing non-physique salient clothes (i.e., clothes that conceal one's physique; Martin Ginis et al., 2008) are all examples of how a fitness instructor can positively influence their clients' experiences in the exercise setting.

Participants in the present study completed each exercise until they reached success; success being defined as completing 10 repetitions of each exercise with proper form and technique. This may imply that personal trainers should assist their clients in performing exercises until they have reached their personal goal; a state that will allow them to feel successful and competent. By overseeing their client in a safe, threat-free

environment while facilitating their success, personal trainers can help improve their client's sense of efficacy.

For all the participants in the present study, it was their first experience training one-on-one with a personal trainer. They appeared to feel extremely comfortable and open with the trainer; in some cases participants emailed the trainer after the orientation to express how comfortable she felt and how much she enjoyed the session. Thus, potentially the safe, familiar, one-on-one nature of the session resulted in equally improved psychological states across all four conditions. This is consistent with the ACSM's most recent survey, which suggested that personal trainers and small group personal training were two of the top 10 worldwide trends for 2012 (Thompson, 2011). Novice exercisers may be turning to personal trainers to not only guide their training regime but also because of the level of comfort and confidence they feel working with a knowledgeable professional. This was reflected in the present study.

Information regarding the personal trainer's ability to improve their client's psychological outcomes when working in the presence of a mirror should be incorporated into the teaching guidelines of personal training certifying bodies, such as The Certified Professional Trainers Network (CPTN). Additionally, it appears that when participants engage in a complex exercise task (i.e., weight training or step class) in either the presence or absence of a mirror, the mirror does not contribute to any significant differences in participants' psychological states. In other words, mirrors do not necessarily negatively influence psychological responses when participants complete a more complex exercise in their presence. Thus, the mirror may provide useful information for novice exercisers with respect to safety and technique reinforcement,

when they are performing complex tasks. Training and certification entities are encouraged to educate prospective trainers on the significant and influential role that mirrors can play in the psychological and emotional state of their clients, as well as their continued adherence to an exercise program. Entities such as CPTN should be encouraged to role play with trainers throughout the certification process, teaching them how to properly deliver cues that emphasize the use of mirrors to assess form and technique; this would ensure trainers are able to deliver these types of cues naturally and comfortably with their clients. By teaching personal trainers how to effectively interact with their clients while properly emphasizing the mirrors for technique purposes, we can hope to improve clients' psychological outcomes, thus translating into long-term exercise adherence.

Further, perhaps teaching novice female weight trainers how to use the mirror for form and technique purposes may be more important in a group exercise setting, where participants may be more subject to social comparisons and self-evaluation (Martin Ginis et al., 2007). In a group exercise class, the presence of co-exercisers appears to increase the evaluative potential of the environment, more so than individual settings (Focht & Hausenblas, 2003, 2004; Martin Ginis et al., 2007). These findings in combination suggest that exercise instructors may consider emphasizing form and technique while using the mirror, in a group exercise class. This may be particularly salient when individuals are engaging in simple tasks such as running or cycling.

Lastly, all conditions in the present study showed outcome improvements following the orientation. This provides additional rationale for the countless benefits associated with weight training. It also highlights how important it is for fitness

instructors to provide novice exercisers with detailed instructions regarding proper form and technique when teaching them exercises; information that could be disseminated to personal trainers and governing bodies.

5.11 Conclusion

In conclusion, the present study examined the impact of directed mirror focus (i.e., look in the mirror) and technique cues (e.g., keep your knees behind your toes during the squat) on outcomes related to exercise correlates. Contrary to our hypotheses, the manipulation did not produce significant differences in any of the variables across conditions (social physique anxiety, task self-efficacy, self-presentational efficacy, revitalization, tranquility, positive engagement, physical exhaustion, intention, and enjoyment). Rather, all conditions showed similar improvements in most variables following the orientation. This was the first study to investigate whether teaching novice exercisers how to perform exercises while emphasizing the use of mirrors for technique purposes could desensitize the exerciser to mirror gazing, thus, improving their psychological outcomes; a recommendation made by Chmelo and colleagues (2009).

The present study confirmed the positive physiological and psychological outcomes associated with an acute bout of exercise. Further, this study was an important initial investigation into what cues fitness instructors should provide to their clients, regarding the use of mirrors for technique reinforcement purposes. These findings suggest that, during a complex task, a personal trainer may help reduce the negative effects of mirrors in novice exercisers; by helping them focus on the proper form and technique involved in each new skill, exercisers can learn to focus their attention on the skill instead of their appearance. This is supported by the fact that participants did not

report any negative effects when they completed weight-training exercises in the presence of a mirror. This investigation took a large step toward understanding what constitutes an ideal training environment for novice female weight trainers. With this information, we can continue working towards developing an environment where women feel confident and comfortable, ultimately enhancing their long-term intention and adherence to exercise. With this knowledge, trainers can play an integral role in their clients' exercise journey toward improved health and well-being.

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Appendices
Appendix A: Poster

Research Participants Wanted

WEIGHT TRAINING ORIENTATION **for a study investigating the factors influencing learning in a weight training orientation for novice FEMALE weight trainers**

WHO CAN PARTICIPATE…?

- Females, 17-25 years of age who do not regularly exercise (<2 times per week) and have not weight trained in the past year.
- Those able to safely perform physical activity (by passing the physical activity readiness questionnaire, PAR-Q).
- Those with no history of a clinically diagnosed eating disorder.
- Those who are not varsity athletes.

WHAT DO YOU HAVE TO DO…?

- Fill out several questionnaires and complete a weight training orientation with a certified personal trainer.
- Participation will take approximately 1 hour (20-30 minutes to complete questionnaires and 30 minutes to complete the weight training session).

WHY GET INVOLVED…?

- An opportunity to learn proper weight training technique and receive a free weight training program.
- Participation will enter you in a draw to win a $20 Starbucks gift card (5 gift cards distributed per school term) or can be used for research credit.
- The decision to participate, not participate or withdraw will not affect one's academic standing.

<u>Contact the following:</u>

Carly Cameron
MSc Candidate
cc09aq@brocku.ca

Dr. Kimberley Gammage
Associate Professor
kgammage@brocku.ca

This study has received ethics clearance through Brock University Research Ethics Board (File #14-025)

Appendix B: Verbal Script

We are doing a study investigating factors influencing learning in a weight training orientation for novice female weight trainers. Females aged 17-25 who do not regularly exercise (<2 times per week), have not weight trained in the past year, are able to safely perform physical activity (by passing the physical activity readiness questionnaire; PAR-Q) with no history of a clinically diagnosed eating disorder and who are not varsity athletes are eligible to participate in this study. As a participant, you will be asked to complete a series of questionnaires, designed to assess feelings related to body image and self-presentation. You will also complete an introductory weight training session with a certified personal trainer where you will learn and perform 8 different exercises targeting each of the major muscle groups. Finally, body weight and height will be collected. You will have the opportunity to increase your knowledge on proper exercise technique and receive a free copy of a weight-training program. Participation will take approximately 1 hour of your time - questionnaire data will take 20-30 minutes and the weight training session will take 30 minutes to complete. To thank you for your participation, you can either be entered in a draw to win 1 of 5 $20 Starbucks gift card distributed each term or you may use this study for course credit. This is an opportunity to learn proper weight training technique from a certified personal trainer and receive a free weight training program specifically tailored to you. Your decision to participate, not participate or withdraw will not affect your academic standing. This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (File #14-025). If you would like to participate in this study or if you have any further questions, please contact Carly Cameron directly at cc09aq@brocku.ca

Appendix C: Measures
Baseline Questionnaires

ID: _____

Demographic Questionnaire

Age: _____ Ethnicity/Race: _____

Height: _____ Weight: _____

Program:_____ Year in School:_____

On average, how many times do you weight train per week? _____

If so, what specific weight training exercises do you do? _____

On average, how many times do you exercise per week? _____

GLTEQ

Considering a **7-day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free-time** (write on each line the appropriate number)?

(a) STRENUOUS EXERCISE (HEART BEATS RAPIDLY) _____/week

(i.e. running, jogging, hockey, football, soccer, squash, basketball,

cross country skiing, judo, roller skating, vigorous swimming,

vigorous long distance bicycling)

(b) MODERATE EXERCISE (NOT EXHAUSTING) _____/week

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball,

badminton, easy swimming, alpine skiing, popular and folk dancing)

(c) MILD EXERCISE (MINIMAL EFFORT) _____/week

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes,

golf, snow-mobiling, easy walking)

Physical Activity Readiness Questionnaire - PAR-Q (revised 2002)

PAR-Q & YOU

(A Questionnaire for People Aged 15 to 69)

Regular physical activity is fun and healthy, and increasingly more people are starting to become more active every day. Being more active is very safe for most people. However, some people should check with their doctor before they start becoming much more physically active.

If you are planning to become much more physically active than you are now, start by answering the seven questions in the box below. If you are between the ages of 15 and 69, the PAR-Q will tell you if you should check with your doctor before you start. If you are over 69 years of age, and you are not used to being very active, check with your doctor.

Common sense is your best guide when you answer these questions. Please read the questions carefully and answer each one honestly: check YES or NO.

YES	NO	
☐	☐	1. **Has your doctor ever said that you have a heart condition and that you should only do physical activity recommended by a doctor?**
☐	☐	2. **Do you feel pain in your chest when you do physical activity?**
☐	☐	3. **In the past month, have you had chest pain when you were not doing physical activity?**
☐	☐	4. **Do you lose your balance because of dizziness or do you ever lose consciousness?**
☐	☐	5. **Do you have a bone or joint problem (for example, back, knee or hip) that could be made worse by a change in your physical activity?**
☐	☐	6. **Is your doctor currently prescribing drugs (for example, water pills) for your blood pressure or heart condition?**
☐	☐	7. **Do you know of any other reason why you should not do physical activity?**

If you answered YES to one or more questions

Talk with your doctor by phone or in person BEFORE you start becoming much more physically active or BEFORE you have a fitness appraisal. Tell your doctor about the PAR-Q and which questions you answered YES.

- You may be able to do any activity you want — as long as you start slowly and build up gradually. Or, you may need to restrict your activities to those which are safe for you. Talk with your doctor about the kinds of activities you wish to participate in and follow his/her advice.
- Find out which community programs are safe and helpful for you.

NO to all questions

If you answered NO honestly to all PAR-Q questions, you can be reasonably sure that you can:

- start becoming much more physically active – begin slowly and build up gradually. This is the safest and easiest way to go.
- take part in a fitness appraisal – this is an excellent way to determine your basic fitness so that you can plan the best way for you to live actively. It is also highly recommended that you have your blood pressure evaluated. If your reading is over 144/94, talk with your doctor before you start becoming much more physically active.

→ **DELAY BECOMING MUCH MORE ACTIVE:**

- if you are not feeling well because of a temporary illness such as a cold or a fever – wait until you feel better; or
- if you are or may be pregnant – talk to your doctor before you start becoming more active.

PLEASE NOTE: If your health changes so that you then answer YES to any of the above questions, tell your fitness or health professional. Ask whether you should change your physical activity plan.

Informed Use of the PAR-Q: The Canadian Society for Exercise Physiology, Health Canada, and their agents assume no liability for persons who undertake physical activity, and if in doubt after completing this questionnaire, consult your doctor prior to physical activity.

No changes permitted. You are encouraged to photocopy the PAR-Q but only if you use the entire form.

NOTE: If the PAR-Q is being given to a person before he or she participates in a physical activity program or a fitness appraisal, this section may be used for legal or administrative purposes.

"I have read, understood and completed this questionnaire. Any questions I had were answered to my full satisfaction."

NAME _____

SIGNATURE _____ DATE _____

SIGNATURE OF PARENT or GUARDIAN (for participants under the age of majority) _____ WITNESS _____

Note: This physical activity clearance is valid for a maximum of 12 months from the date it is completed and becomes invalid if your condition changes so that you would answer YES to any of the seven questions.

Trait Questionnaires

SPAS

ID:_____

Read each of the following statements carefully and indicate the degree to which the statement is characteristic or true of you. Use the following scale. Circle the appropriate value following each statement.

1 = Not at all characteristic of me
2 = Slightly characteristic of me
3 = Moderately characteristic of me
4 = Very characteristic of me
5 = Extremely characteristic of me

1. I feel uptight about my physique/ figure.	1	2	3	4	5
2. I am bothered by thoughts that the other people are evaluating my weight or muscular development negatively.	1	2	3	4	5
3. Unattractive features of my physique/ figure make me nervous.	1	2	3	4	5
4. I feel apprehensive about my physique/ figure.	1	2	3	4	5
5. I am comfortable with how fit my body appears to others.	1	2	3	4	5
6. It would make me uncomfortable to know that other people were evaluating my physique/ figure.	1	2	3	4	5
7. When it comes to displaying my physique/ figure, I feel shy.	1	2	3	4	5
8. I feel nervous about the shape of my body.	1	2	3	4	5
9. I feel relaxed when it is obvious that others are looking at my physique/ figure.	1	2	3	4	5

Pre-Test Measures

Pre – S-SPAS ID:_____

Read each of the following statements carefully and indicate the degree to which the statement is true of you RIGHT NOW, according to the following scale:

1 = Not at all true
2 = Slightly true
3 = Moderately true
4 = Very true
5 = Extremely true

1. I am uptight about my physique/figure. _____

2. I am bothered by thoughts that other people are evaluating my weight or muscular development negatively. _____

3. I am nervous about unattractive features of my physique/figure. _____

4. Right now, I feel apprehensive about my physique/figure. _____

5. I am comfortable with how fit my body appears to others. _____

6. I am uncomfortable knowing others are evaluating my physique/figure. _____

7. I am shy because I am displaying my physique/figure to others. _____

8. I feel relaxed even though it is obvious that others are looking at my physique/figure._____

9. Sitting here in my shorts and t-shirt, I feel nervous about the shape of my body. _____

I.D. _____

Pre – SPE

Think about the training session that you will be doing today. Using any values from this scale (0 to 100%), please indicate how confident you are for each of the following:

0%----------50%----------100%

Not at all confident Completely Confident

How confident are you that…

1. The trainer will think that you have good physical co-ordination. _____
2. The trainer will think that your body looks fit and toned. _____
3. The trainer will think that you have good stamina. _____
4. The trainer will think that you are someone who works out regularly. _____
5. The trainer will think that you are in good shape. _____

I.D. _____

Pre - TSE

For the following statements please list your level of confidence on a 0% = *no confidence* to 100% = *completely confident* for each of the following during your upcoming training session.

0%----------50%----------100%

How confident are you that you can…

(1) perform all the required movements_____%

(2) follow directions from a personal trainer_____%

(3) use proper form/technique for each exercise_____%

(4) complete required number of repetitions for each exercise_____%

(5) correct your form/technique based on feedback from a personal trainer_____%

Pre-EFI I.D. _____

Instructions: Please use the following scale to indicate the extent to which each word below describes how you feel at this moment in time. Record your responses by ticking the appropriate box next to each word.

FEELING	Do not feel	Feel slightly	Feel moderately	Feel strongly	Feel very strongly
1. Refreshed	( )	( )	( )	( )	( )
2. Calm	( )	( )	( )	( )	( )
3. Fatigued	( )	( )	( )	( )	( )
4. Enthusiastic	( )	( )	( )	( )	( )
5. Relaxed	( )	( )	( )	( )	( )
6. Energetic	( )	( )	( )	( )	( )
7. Happy	( )	( )	( )	( )	( )
8. Tired	( )	( )	( )	( )	( )
9. Revived	( )	( )	( )	( )	( )
10. Peaceful	( )	( )	( )	( )	( )
11. Worn-out	( )	( )	( )	( )	( )
12. Upbeat	( )	( )	( )	( )	( )

Post-Test Questionnaires

Post – S-SPAS ID:_____

Read each of the following statements carefully and indicate the degree to which the statement is true of you RIGHT NOW, according to the following scale:

1 = Not at all true

2 = Slightly true

3 = Moderately true

4 = Very true

5 = Extremely true

1. I am uptight about my physique/figure. _____

2. I am bothered by thoughts that other people are evaluating my weight or muscular development negatively. _____

3. I am nervous about unattractive features of my physique/figure. _____

4. Right now, I feel apprehensive about my physique/figure. _____

5. I am comfortable with how fit my body appears to others. _____

6. I am uncomfortable knowing others are evaluating my physique/figure. _____

7. I am shy because I am displaying my physique/figure to others. _____

8. I feel relaxed even though it is obvious that others are looking at my physique/figure._____

9. Sitting here in my shorts and t-shirt, I feel nervous about the shape of my body. _____

I.D. _____

Post – SPE

Think about the training session that you completed today. Using any values from this scale (0 to 100%), please indicate how confident you were for each of the following:

0%----------50%----------100%

Not at all confident Completely Confident

How confident are you that…

6. The trainer thought that you have good physical co-ordination. _____
7. The trainer thought that your body looks fit and toned. _____
8. The trainer thought that you have good stamina. _____
9. The trainer thought that you are someone who works out regularly. _____
10. The trainer thought that you are in good shape. _____

I.D. _____

Post - TSE

For the following statements please list your level of confidence on a 0% = *no confidence* to 100% = *completely confident* based on the weight training session that you just completed.

0%----------50%----------100%

How confident are you that you…

(1) performed all the required movements_____%

(2) followed directions from a personal trainer_____%

(3) used proper form/technique for each exercise_____%

(4) completed required number of repetitions for each exercise_____%

(5) corrected your form/technique based on feedback from a personal trainer_____%

I.D. _____

Post - EFI

Instructions: Please use the following scale to indicate the extent to which each word below describes how you feel at this moment in time. Record your responses by ticking the appropriate box next to each word.

FEELING	Do not feel	Feel slightly	Feel moderately	Feel strongly	Feel very strongly
1. Refreshed	( )	( )	( )	( )	( )
2. Calm	( )	( )	( )	( )	( )
3. Fatigued	( )	( )	( )	( )	( )
4. Enthusiastic	( )	( )	( )	( )	( )
5. Relaxed	( )	( )	( )	( )	( )
6. Energetic	( )	( )	( )	( )	( )
7. Happy	( )	( )	( )	( )	( )
8. Tired	( )	( )	( )	( )	( )
9. Revived	( )	( )	( )	( )	( )
10. Peaceful	( )	( )	( )	( )	( )
11. Worn-out	( )	( )	( )	( )	( )
12. Upbeat	( )	( )	( )	( )	( )

I.D._____

Post – INT

Think about the training session you performed today. With that in mind, please indicate your level of agreement for the following statements.

I intend to weight train one or two times per week for the next 4 weeks

1	**2**	**3**	**4**	**5**	**6**	**7**
Extremely unlikely						Extremely likely

I intend to weight train two or three times per week for the next 4 weeks

1	**2**	**3**	**4**	**5**	**6**	**7**
Extremely unlikely						Extremely likely

I intend to weight train three or four times per week for the next 4 weeks

1	**2**	**3**	**4**	**5**	**6**	**7**
Extremely unlikely						Extremely likely

Post – PACES modified

Think about the training session you performed today. With that in mind, please indicate your level of agreement for the following statements.

"I enjoyed it…"

1	2	3	4	5	6	7
NO			NEUTRAL			YES

"It was a lot of fun…"

1	2	3	4	5	6	7
NO			NEUTRAL			YES

ID:_____

Appendix D: Manipulation Checks

Manipulation Check #1: Mirror present with mirror cues emphasizing technique, Mirror present with technique cues but no mention of mirror and Mirror present with general feedback but no technique cues conditions

1. Please write, as specifically as possible, 3 instructions/pieces of feedback given to you by the trainer in the weight training session you just completed.

    1. _____

    2. _____

    3. _____

2. As you were completing each of the exercises in the weight training session, what did you ***focus your attention on*** the most?

    ☐ Form and technique

    ☐ The trainer

    ☐ Your appearance

    ☐ The equipment

    ☐ Other: _____

3. How ***frequently*** did you look in the mirror in the weight training session you just completed?

Never	Seldom	Sometimes	Often	Always
☐	☐	☐	☐	☐

Manipulation Check #2: No mirror present with technique cues condition

1. Please write, as specific as possible, 3 instructions/pieces of feedback given to you by the trainer in the weight training session you just completed.

   1. _____

   2. _____

   3. _____

2. As you were completing each of the exercises in the weight training session, what did you ***focus your attention on*** the most?

   ☐ Form and technique

   ☐ The trainer

   ☐ Your appearance

   ☐ The equipment

   ☐ Other: _____

Appendix E: Certificate of Ethics Clearance for Human Participant Research

Brock University
Research Ethics Office
Tel: 905-688-5550 ext. 3035
Email: reb@brocku.ca

Bioscience Research Ethics Board

Certificate of Ethics Clearance for Human Participant Research

DATE:	9/12/2014		
PRINCIPAL INVESTIGATOR:	GAMMAGE, Kimberley - Kinesiology		
FILE:	14-025 - GAMMAGE		
TYPE:	Masters Thesis/Project	STUDENT:	Carly Cameron
		SUPERVISOR:	Kimberley Gammage

TITLE: Factors Influencing Learning in a Weight Training Orientation for Novice Female Weight Trainers

ETHICS CLEARANCE GRANTED

Type of Clearance: NEW Expiry Date: 9/30/2015

The Brock University Bioscience Research Ethics Board has reviewed the above named research proposal and considers the procedures, as described by the applicant, to conform to the University's ethical standards and the Tri-Council Policy Statement. Clearance granted from **9/12/2014** to **9/30/2015.**

The Tri-Council Policy Statement requires that ongoing research be monitored by, at a minimum, an annual report. Should your project extend beyond the expiry date, you are required to submit a Renewal form before 9/30/2015. Continued clearance is contingent on timely submission of reports.

To comply with the Tri-Council Policy Statement, you must also submit a final report upon completion of your project. All report forms can be found on the Research Ethics web page at http://www.brocku.ca/research/policies-and-forms/research-forms.

In addition, throughout your research, you must report promptly to the REB:

a) Changes increasing the risk to the participant(s) and/or affecting significantly the conduct of the study;
b) All adverse and/or unanticipated experiences or events that may have real or potential unfavourable implications for participants;
c) New information that may adversely affect the safety of the participants or the conduct of the study;
d) Any changes in your source of funding or new funding to a previously unfunded project.

We wish you success with your research.

Approved:

Brian Roy, Chair
Bioscience Research Ethics Board

Note: Brock University is accountable for the research carried out in its own jurisdiction or under its auspices and may refuse certain research even though the REB has found it ethically acceptable.

If research participants are in the care of a health facility, at a school, or other institution or community organization, it is the responsibility of the Principal Investigator to ensure that the ethical guidelines and clearance of those facilities or institutions are obtained and filed with the REB prior to the initiation of research at that site.

Appendix F: Letter of Invitation

Letter of Invitation

Project Title: Factors Influencing Learning in a Weight Training Orientation for Novice Female Weight Trainers

Principal Student Investigator: Carly Cameron, BSc, Department of Kinesiology, Brock University

Principal Investigator: Dr. Kimberley Gammage, Associate Professor, Department of Kinesiology, Brock University

I, Kimberley Gammage, PhD, from the Department of Kinesiology, Brock University, invite you to participate in a research project entitled *Factors Influencing Learning in a Weight Training Orientation for Novice Female Weight Trainers.*

The purpose of this study is to determine the factors that influence learning during a weight training orientation in novice female weight trainers.

Participation will take approximately 1 hour (20-30 minutes to complete questionnaire data and 30 minutes to complete the weight training session). Females aged 17-25 years of age who do not regularly exercise (<2 times per week), have not weight trained in the past year, are able to safely perform physical activity (by passing the physical activity readiness questionnaire; PAR-Q), with no history of a clinically diagnosed eating disorder and who are not varsity athletes are eligible to participate in this study. As a participant, you will be asked to complete a series of questionnaires, designed to assess feelings related to body image and self-presentation. You will also complete an introductory weight training session, one-on-one with a certified personal trainer where you will learn and perform 8 different exercises targeting each of the major muscle groups. Finally, body weight and height will be collected. You will have the opportunity to increase your knowledge on proper exercise technique and receive a free copy of a weight-training program. To compensate you for your time and participation, you may receive a one-hour course credit for research participation or you can be entered in a draw for a $20 Starbucks gift card (5 gift cards distributed per term). If you are interested in participating, please contact Carly Cameron (see email address below) to set up a day and time to complete the study.

You may experience some discomfort due to the sensitive or personal nature of the questions being asked. In addition, there are some potential physical risks involved in participation as physical activity will take place (e.g., muscle strain, fatigue, muscle soreness, physical discomfort associated with performing exercises the body is not accustomed to, pain that will be closely monitored by the principal student investigator as she is a certified personal trainer). In this event, contact information for Dr. Gammage, student health services (905-688-5550 ext.3243, http://www.brocku.ca/healthservices), the Niagara Distress Center (905-688-3711,www.distresscentreniagara.com/),or www.211Niagara.ca have been provided.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905-688-5550 ext. 3035, reb@brocku.ca). If you have any other questions, please feel free to contact me. Thank you.

Principal Student Investigator:
Carly Cameron, BSc
Department of Kinesiology
Brock University
cc09aq@brocku.ca

Principal Investigator:
Dr. Kimberley Gammage, Associate Professor
Department of Kinesiology
Brock University
905-688-5550 x3772
kgammage@brocku.ca

This study has been reviewed and received ethics clearance through Brock University Research Ethics Board (file #14-025).

Appendix G: Informed Consent

Date: Fall 2014
Project Title: Factors Influencing Learning in a Weight Training Orientation for Novice Female Weight Trainers

Principal Student Investigator:
Carly Cameron, BSc
Department of Kinesiology
Brock University
cc09aq@brocku.ca

Principal Investigator:
Dr. Kimberley Gammage, Associate Professor
Department of Kinesiology
Brock University
905-688-5550 x3772
kgammage@brocku.ca

INVITATION

You are invited to participate in a study that involves research. The purpose of this study is to investigate the factors influencing learning in a weight training orientation for novice female weight trainers.

WHAT'S INVOLVED

As a participant, you will be asked to complete a series of questionnaires, designed to assess feelings and thoughts related to your body. You will also complete an introductory weight training session (including a warm-up and cool-down) with a certified personal trainer where you will learn and perform 8 different exercises targeting each of the major muscle groups. Finally, body weight and height measures will be collected. You will have the opportunity to increase your knowledge on proper exercise technique and receive a free copy of a weight-training program. Participation will take approximately 1 hour of your time (20-30 minutes to complete questionnaire data and approximately 30 minutes to complete the weight training session). Females aged 17-25 who do not regularly exercise (<2 times per week), have not weight trained in the past year, are able to safely perform physical activity (by passing the physical activity readiness questionnaire; PAR-Q) with no history of a clinically diagnosed eating disorder and who are not varsity athletes are eligible to participate in this study.

POTENTIAL BENEFITS AND RISKS

You will receive a weight training orientation session from a certified personal trainer and a free copy of the individualized weight-training program. To compensate you for your participation, you may receive one-hour course credit for research participation or can be entered in a draw for a $20 Starbucks gift card (5 gift cards will be distributed each school term). You may experience some discomfort due to the nature of the questions being asked – some questions may be personal or sensitive as they inquire about your thoughts and feelings about your body. You do not have to answer any questions that make you feel uncomfortable, and there are no consequences associated with this. In the event that you feel uncomfortable due to any of the questions that you answer, contact information for Dr. Gammage and student health services has been provided, for those who are interested in seeking counseling services (905-688-5550 ext.3243, http://www.brocku.ca/healthservices). Some physical risks are related to

participation in this study (e.g., muscle strain, fatigue, muscle soreness, physical discomfort associated with performing exercises the body is not accustomed to, pain that will be closely monitored by the principal student investigator as she is a certified personal trainer) due to physical activity; the trainer possesses current CPR/First Aid qualifications and is a certified personal trainer through The Certified Professional Trainers Network (CPTN). She will ensure proper form and safety throughout the entire session and will further manage physical risk by including a warm up and cool down to minimize the chances of muscle soreness.

CONFIDENTIALITY AND ANONYMITY

All data is anonymous. Any information that you provide for the purpose entering the draw will be treated with confidentiality. Please do not place your name or any identifying information on the questionnaires. Data collected during this study will be stored in a locked filing cabinet in the lab of Dr. Gammage at Brock University and will be shredded 5 years following publication of the study. Access to this data will be restricted to the principal investigator, principal student investigator and their research team.

VOLUNTARY PARTICIPATION

Participation in this study is voluntary. If you wish, you may decline to answer any questions or participate in any component of the study. Further, you may decide to withdraw from this study at any time and may do so without any penalty or loss of benefits to which you are entitled. You may withdraw from the study by contacting the principal student investigator by email (Carly Cameron – cc09aq@brocku.ca). After you submit your completed questionnaires, it will not be possible to withdraw, as your questionnaires will not be identifiable. Your decision to participate, not participate or to withdraw will not affect your academic standing.

PUBLICATION OF RESULTS

Results of this study may be published in professional journals and presented at conferences. Your identity will remain completely anonymous during publication.

CONTACT INFORMATION AND ETHICS CLEARANCE

If you have any questions about this study or require further information, please contact the Principal Student Investigator or the Faculty Supervisor (where applicable) using the contact information provided above. This study has been reviewed and received ethics clearance through the Research Ethics Board at Brock University (File #14-025). If you have any comments or concerns about your rights as a research participant, please contact the Research Ethics Office at (905) 688-5550 Ext. 3035, reb@brocku.ca.
Thank you for your assistance in this project. Please keep a copy of this form for your records.

CONSENT FORM

I agree to participate in this study described above. I have made this decision based on the information I have read in the Information-Consent Letter. I have had the opportunity to receive any additional details I wanted about the study and understand that I may ask questions in the future. I understand that I may withdraw this consent at any time.

Name: _____

Signature: _____ Date:_____

Appendix H*:* Re-Consent/Debriefing Form

Fall 2014

Project Title: Factors Influencing Learning in a Weight Training Orientation for Novice Female Weight Trainers

Principal Student Investigator: Carly Cameron, BSc, Department of Kinesiology, Brock University

Principal Investigator: Dr. Kimberley Gammage, Associate Professor, Department of Kinesiology, Brock University

The true purpose of this study was to examine whether directing an individual's attention to the mirror for technique and form purposes during a weight training session may lessen any negative psychological outcomes that are generally associated with exercising in front of a mirror in women who are not active. You were randomly assigned to one of four conditions; each condition differing in the overall focus of the session (i.e., mirror or no mirror) as well as the verbal cues provided. In the mirror present with mirror cues emphasizing technique condition, the trainer would have told you to "look in the mirror" before providing you with a piece of advice regarding your form and technique. In the mirror present with technique cues but no mention of mirror condition, the trainer would have simply provided you with advice regarding your exercise technique without directing your focus to the mirror. In the mirror present with general feedback but no technique cues condition, the trainer would have provided you with general, vague feedback (e.g., well done, good effort) without directing your focus to the mirror. In no mirror present with technique cues condition, the session would have taken place in a room without any mirror and the trainer would have provided you with advice regarding your exercise technique.

We are particularly interested if directing an individual's focus to the mirror for technique purposes, as opposed to appearance purposes, has any significant effect on exercise-related outcomes (e.g., intention to exercise, body image, self-efficacy and enjoyment). In addition we are interested to see if these conditions affected self-presentational concerns while exercising (e.g., social physique anxiety). We did not reveal the true purpose of the study to you, because knowing in advance may have influenced your responses.
If you have any questions, please feel free to contact the researchers (see below for contact information). Thank you again for your help.

Re-Consent:

I have been asked to give permission to the researchers to use my data in their study, and agree to this request. During the debriefing session, I was given an explanation as to why the researchers had to disguise the true purpose of this study. Contact information for Dr. Gammage, student health services (905-688-5550 ext.3243, http://www.brocku.ca/healthservices), the Niagara Distress Center (905-688-3711,www.distresscentreniagara.com/), and www.211Niagara.ca is provided.

Information regarding body image concerns can be found at the following official websites: www.nedic.ca and www.womenshealth.gov/. Please note, people come in all shapes, sizes and performance abilities, and healthy bodies fall along a continuum – there is not a single normal or healthy body weight or shape.

I am aware I may contact Brock University's Research Ethics Office regarding my rights as a research participant (905-688-5550 ext. 3035 or reb@brocku.ca).

Date: _____

Participant name (please print): _____

Participant signature: _____

Principal Student Investigator:
Carly Cameron, BSc
Department of Kinesiology
Brock University
cc09aq@brocku.ca

Principal Investigator:
Dr. Kimberley Gammage, Associate Professor
Department of Kinesiology
Brock University
905-688-5550 x3772
kgammage@brocku.ca

Appendix I*:* Introductory Weight Training Program

Exercise	**Muscle Group**	**Start**	**Finish**	**Notes**	**Weight (lbs)**	**Repetitions**	**Sets**
Chest Press	Pectoralis Major						
Bent Over Row	Latissimus Dorsi						

Bicep Curl	Biceps Brachii						
Triceps Kickback	Triceps Brachii						
Lateral Dumbbell Raise	Deltoids (Lateral)						

Body Weight Squat	Quadriceps, Hamstrings, Gluteals, Calves						
Lunge	Quadriceps, Gluteals, Hamstrings						
Plank	Erector spinae, Rectus abdominis, Transverse abdominus						

Appendix J*:* Checklist for Consistency

Item	**Mirror present with mirror cues emphasizing technique condition**	Checklist
Researcher: Trainer in back room	1. Greet participant, assign "ID" number 2. Informed consent 3. Demographic questionnaire 4. Baseline questionnaire 5. Trait Measures (SPAS) 6. Pre-test Questionnaire (S-SPA, SPE, TSE, Feeling States) 7. Introduce personal trainer once questionnaires are complete.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐
Introduction: Trainer Introduced	1. "Hi my name is Carly. 2. Shake hand "Nice to meet you (Participants Name)!" 3. I will be running your introductory weight training session today. I'm a master student in the Faculty of Applied Health Sciences. I am a CPTN certified personal trainer. 4. First we're going to perform a warm-up. Do you have any questions? 5. Are you ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Warm-Up	1. For the warm-up we will get you on the treadmill to start. 2. Demonstrate first then allow participant to try. 3. I will get you to warm-up for 10 minutes at 3.0 mph, just walking. 4. The purpose of a warm-up is to avoid injury and get your muscles ready for exercise. A good warm-up will cause a light sweat; you should be working at about 7 out of 10. A good way to judge this is if you can maintain a conversation while warming-up. 5. Following our warm-up we will start our introductory weight training session. Are you feeling warm? Ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Chest Press	1. We are going to complete all the exercises today in this specific corner of the room – this way you have a clear view of yourself in the mirror, from both the front and the side. This is to ensure that you can watch and correct your weight training form and technique throughout the orientation, based on my instructions and feedback.	1. ☐

	2. For the weight training exercises I will show you the exercise first, then you may try 10 repetitions, and then I will help you with your form if needed. 3. You want to use a weight that allows you to remain control of the movement at all times. I can recommend a weight for you for each exercise and you can tell me if you need heavier or lighter. 4. First we will be performing a chest press. 5. This exercise targets our chest muscles. 6. Point to muscle group and show. 7. For this exercise we will be using a resistance band, wrapped around the stationary bicycle. 8. Using a resistance band is a great way to target the chest in a different way and change things up from the traditional press with dumbbells. 9. The band may make this exercise feel tougher, but you always have control over the level of tension by moving closer or further away from the center of the band. 10. To start: Holding one handle in each hand, face away from the bike, legs hip width apart with a slight bend in the knee. 11. Begin with your hands next to your chest and elbows out. Exhale and fully extend your arms. 12. Inhale and bring them back to 90-degrees. 13. Avoid locking the elbows 14. Allow participant to try. 15. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 16. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐
Bent Over Row	1. For our next exercise we will give our chest muscles a break and work our back. 2. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 3. Place your inside knee and hand on the bench, bending forward. 4. Demonstrate the exercise: with the dumbbell in the outside hand, keep the arm extended. 5. Exhale, and pull the dumbbell up towards the rib cage, keeping the elbow in.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐

	6. The elbow should be higher than your back when you end the movement. 7. Pause, inhale and lower the dumbbell back down, fully extending the arm. 8. Allow participant to try. 9. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Bicep Curl	1. Next we will perform the bicep curl, which works the front of our arm here. 2. Point to biceps. 3. To start: Have feet shoulder width apart with a slight bend in your knees. 4. Keep the shoulders back and head up. 5. Grasp the bar with supinated grip (palms facing to the sky). Hands should be placed slightly wider than hip width. 6. Tuck your elbows into your sides. 7. While exhaling flex at the elbow and curl the bar towards the chest – pause and lower the bar back to the starting position while inhaling. 8. Allow participant to try. 9. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Triceps Kickback	1. It's good to work apposing muscles so since we just worked the biceps, we're going to counter it by working the triceps – the back of the arm. 2. Point to the muscle being worked 3. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 4. Place your inside knee and hand on the bench, bending forward. 5. Demonstrate the exercise: Grasp the dumbbell with the outside hand, keeping your elbow at a 90-degree angle, arm hugged into the rib cage. 6. Exhale and push the dumbbell back, keeping the upper arm stationary against the body, until the forearm is parallel with the body. 7. Contract the triceps at the end of the motion.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐

	8. Pause, inhale and slowly bring the dumbbell back to the start position to complete one repetition. 9. Upon completion of the set we will repeat the exercise on the opposite arm. 10. Allow participant to try. 11. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 12. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐
Lateral Dumbbell Raise	1. Alright we are halfway – great job so far! 2. This next exercise is going to work our deltoids. 3. Point to the muscles being worked. 4. To start: we're going to use the same stance as the last two exercises: feet shoulder width apart, knees slightly bent. 5. Grasp a dumbbell in each hand and hold them together in front of the body with the palms facing inward. 6. Keeping a slight bend in the elbows, exhale and raise the dumbbells directly out to the side until they're at shoulder level. 7. Pause at the top, inhale and slowly lower the dumbbells to the front of the body 8. Avoid swinging the movement. 9. Allow participant to try. 10. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 11. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐
Body-weight Squat	1. Now that your upper body is feeling pretty tired we can move to the lower body exercises. 2. For the next exercise we will just be using our body weight – it's a very effective exercise because it works several major muscle groups - quadriceps, hamstrings, glutes, and calves." 3. Point to muscles groups. 4. To start: feet are positioned side-by-side, approximately hip-width apart and directly under the shoulders. Toes pointed slightly outward 5. Keep your chest up and looking straight ahead	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐

	6. We are going to pretend like we are going to sit on a chair – begin the descent at the hips by pushing the buttocks backwards. 7. Inhale and lower until the thighs are parallel with the ground, keeping all the weight in the heels. 8. Make sure the knees remain behind the toes. 9. Pause slightly in the lowest position and exhale on the way up. 10. We will use these two pieces of tape on the mirror to guide our movement and ensure we are doing the squat currently without injury. 11. Look at the horizontal piece of tape in the mirror to ensure you are reaching a 90 degree angle in the squat position. The tape is a guideline for you –it indicates where your legs and buttocks should be at the bottom of the squat. Use the tape on the mirror as a goal for where you want your legs and buttocks to reach at the bottom of your squat. When you are in a seated position and your legs are parallel with the tape on the mirror, you have reached 90 degrees in depth. (*Note:* The tape was placed at a different height each session depending on the participant's height). 12. Look at the vertical piece of tape in the mirror to ensure your knees are remaining stacked over your toes. Again, the tape is a guideline for you – try to line your knee and toes up with the tape so they are parallel. (*Note:* The tape was placed at a different height each session depending on the participant's height). 13. Allow participant to try. 14. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 15. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐
Lunge	1. Next we are going to focus on the muscles our lower body by performing the lunge. 2. To start: Stand erect, with feet approximately 6-12 inches apart. 3. With the toes pointed straight, take one exaggerated step forward (approximately 1 meter) with the desired leg. 4. Land on the heel of the lead foot while pivoted off the ball of the trailing foot. 5. Keep the head up, chest out and hips forward. 6. Inhale while slowly flexing the lead leg, lower the trailing leg towards the ground. 7. The lead leg remains directly over the ankle with the shin perpendicular to the	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐

	ground. 8. There should be no forward movement of the shin in this lead leg. 9. Pause once the knee of the trailing leg reaches 2-4 inches above the floor. 10. Exhaling, push off the forward leg until starting position is reached. 11. Repeat the process with the opposite leg. 12. Again, we will use the tape on the mirror to assist us with the lunge. 13. Look at the vertical piece of tape in the mirror to ensure your knee is remaining stacked over your toes. The tape is a guideline for you – try to line your knee and toes up with the tape so they are parallel. (*Note:* The tape was placed at a different height each session depending on the participant's height). 14. Allow participant to try. 15. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 16. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐
Plank	1. Last exercise! We're almost there. For this one we're going to focus on engaging our core muscle with an exercise known as the "plank." 2. Point to the muscle group. 3. The plank involves maintaining a difficult position for extended periods of time. The most common plank – which we will perform today – is the front plank which is held in a push-up position with the body's weight on the forearms, elbows, and toes. 4. To start: We're going to lay face down on the mat. 5. Next, prop your upper body up by placing your forearms on the mat, keeping your elbows under your shoulders and your arms parallel to one another. 6. Place your legs shoulder width apart. 7. Raise your body upward until it is parallel with the ground. 8. Keep your head in a neutral position and toes curled under for support. 9. Try to pull your belly button towards your spine to engage your core muscles. 10. Hold position for 30 seconds. 11. Exercise can be made more challenging by increasing the time interval. 12. We will be using the tape on the mirror for the plank exercise as well.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐

	13. Look at the horizontal piece of tape in the mirror to ensure your head, back and buttocks remain in a neutral, flat position throughout the entire duration of the plank. (*Note:* The tape was placed at a different height each session depending on the participant's height). 14. Allow participant to try. 15. Correct movement: Look in the mirror. You're doing a great job of * positive feedback regarding technique* 16. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	13. ☐ 14. ☐ 15. ☐ 16. ☐
Cool-Down	1. You've completed the weight-training portion. Now we're going to do a cool-down. The cool-down is important to help your breathing levels and heart rate return to normal. 2. To start: I will get you to just walk for approximately 5-10 minutes. 3. Similar to the warm up only at an easy/slow pace.	1. ☐ 2. ☐ 3. ☐
Flexibility Training	1. To finish off we're going to do some flexibility training. This is important to increase your body's range of motion and decrease the risk of injury. 2. I will lead you through a full-body stretch, targeting the major muscles worked today. 3. To start: We are going to sit on the mats, hinging at the hips, reaching out towards our toes, when you feel the stretch in your hamstrings (back of your leg) pause and hold for 20 seconds. 4. Continue stretches for: quadriceps, glutes, claves, core, lower back, triceps, biceps, chest, back, shoulders, and neck. 5. Correct movement: Look in the mirror. You're doing a great job of *positive feedback regarding technique* 6. Incorrect movement: Look in the mirror. Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐
Closing Remarks	1. Great job we're all done! 2. Do you have any questions? 3. The researcher is going to give you a few more questionnaires to complete before you go home.	1. ☐ 2. ☐ 3. ☐

Item	**Mirror present with technique cues but no mention of mirror condition**	Checklist
Researcher: Trainer in back room	1. Greet participant, assign "ID" number 2. Informed consent 3. Demographic questionnaire 4. Baseline questionnaire 5. Trait Measures (SPAS) 6. Pre-test Questionnaire (S-SPA, SPE, TSE, Feeling States) 7. Introduce personal trainer once questionnaires are complete.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐
Introduction: Trainer Introduced	1. "Hi my name is Carly. 2. Shake hand "Nice to meet you (Participants Name)!" 3. I will be running your introductory weight training session today. I'm a master student in the Faculty of Applied Health Sciences. I am a CPTN certified personal trainer. 4. First we're going to perform a warm-up. Do you have any questions? 5. Are you ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Warm-Up	1. For the warm-up we will get you on the treadmill to start. 2. Demonstrate first then allow participant to try. 3. I will get you to warm-up for 10 minutes at 3.0 mph, just walking. 4. The purpose of a warm-up is to avoid injury and get your muscles ready for exercise. A good warm-up will cause a light sweat; you should be working at about 7 out of 10. A good way to judge this is if you can maintain a conversation while warming-up. 5. Following our warm-up we will start our introductory weight training session. Are you feeling warm? Ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Chest Press	1. Participants will be situated in the same corner of the room as the mirror cues + technique cues condition, to ensure they have the same opportunity to see themselves in the mirror. However, the trainer will not explicitly tell the participant to look in the mirror as seen in the previous condition (e.g., "We are going to begin our orientation over here"). 2. For the weight training exercises I will show you the exercise first, then you may try 10 repetitions, and then I will help you with your form if needed. 3. You want to use a weight that allows you to remain control of the movement at all	1. ☐ 2. ☐ 3. ☐

	times. I can recommend a weight for you for each exercise and you can tell me if you need heavier or lighter. 4. First we will be performing a chest press. 5. This exercise targets our chest muscles. 6. Point to muscle group and show. 7. For this exercise we will be using a resistance band, wrapped around the stationary bicycle. 8. Using a resistance band is a great way to target the chest in a different way and change things up from the traditional press with dumbbells. 9. The band may make this exercise feel tougher, but you always have control over the level of tension by moving closer or further away from the center of the band. 10. To start: Holding one handle in each hand, face away from the bike, legs hip width apart with a slight bend in the knee. 11. Begin with your hands next to your chest and elbows out. Exhale and fully extend your arms. 12. Inhale and bring them back to 90-degrees. 13. Avoid locking the elbows 14. Allow participant to try. 15. Correct movement: You're doing a great job of * positive feedback regarding technique* 16. Incorrect movement: Try to *advice regarding technique*	4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐
Bent Over Row	1. For our next exercise we will give our chest muscles a break and work our back. 2. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 3. Place your inside knee and hand on the bench, bending forward. 4. Demonstrate the exercise: with the dumbbell in the outside hand, keep the arm extended. 5. Exhale, and pull the dumbbell up towards the rib cage, keeping the elbow in. 6. The elbow should be higher than your back when you end the movement. 7. Pause, inhale and lower the dumbbell back down, fully extending the arm. 8. Allow participant to try.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐

	9. Correct movement: You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Try to *advice regarding technique*	9. ☐ 10. ☐
Bicep Curl	1. Next we will perform the bicep curl, which works the front of our arm here. 2. Point to biceps. 3. To start: Have feet shoulder width apart with a slight bend in your knees. 4. Keep the shoulders back and head up. 5. Grasp the bar with supinated grip (palms facing to the sky). Hands should be placed slightly wider than hip width. 6. Tuck your elbows into your sides. 7. While exhaling flex at the elbow and curl the bar towards the chest – pause and lower the bar back to the starting position while inhaling. 8. Allow participant to try. 9. Correct movement: You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Triceps Kickback	1. It's good to work apposing muscles so since we just worked the biceps, we're going to counter it by working the triceps – the back of the arm. 2. Point to the muscle being worked 3. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 4. Place your inside knee and hand on the bench, bending forward. 5. Demonstrate the exercise: Grasp the dumbbell with the outside hand, keeping your elbow at a 90-degree angle, arm hugged into the rib cage. 6. Exhale and push the dumbbell back, keeping the upper arm stationary against the body, until the forearm is parallel with the body. 7. Contract the triceps at the end of the motion. 8. Pause, inhale and slowly bring the dumbbell back to the start position to complete one repetition. 9. Upon completion of the set we will repeat the exercise on the opposite arm. 10. Allow participant to try.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐

	11. Correct movement: You're doing a great job of * positive feedback regarding technique* 12. Incorrect movement: Try to *advice regarding technique*	11. ☐ 12. ☐
Lateral Dumbbell Raise	1. Alright we are halfway – great job so far! 2. This next exercise is going to work our deltoids. 3. Point to the muscles being worked. 4. To start: we're going to use the same stance as the last two exercises: feet shoulder width apart, knees slightly bent. 5. Grasp a dumbbell in each hand and hold them together in front of the body with the palms facing inward. 6. Keeping a slight bend in the elbows, exhale and raise the dumbbells directly out to the side until they're at shoulder level. 7. Pause at the top, inhale and slowly lower the dumbbells to the front of the body 8. Avoid swinging the movement. 9. Allow participant to try. 10. Correct movement: You're doing a great job of * positive feedback regarding technique* 11. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐
Body-weight Squat	1. Now that your upper body is feeling pretty tired we can move to the lower body exercises. 2. For the next exercise we will just be using our body weight – it's a very effective exercise because it works several major muscle groups - quadriceps, hamstrings, glutes, and calves." 3. Point to muscles groups. 4. To start: feet are positioned side-by-side, approximately hip-width apart and directly under the shoulders. Toes pointed slightly outward 5. Keep your chest up and looking straight ahead 6. We are going to pretend like we are going to sit on a chair – begin the descent at the hips by pushing the buttocks backwards. 7. Inhale and lower until the thighs are parallel with the ground, keeping all the weight in the heels.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐

	8. Make sure the knees remain behind the toes. 9. Pause slightly in the lowest position and exhale on the way up. 10. Allow participant to try. 11. Correct movement: You're doing a great job of * positive feedback regarding technique* 12. Incorrect movement: Try to *advice regarding technique*	8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐
Lunge	1. Next we are going to focus on the muscles our lower body by performing the lunge. 2. To start: Stand erect, with feet approximately 6-12 inches apart. 3. With the toes pointed straight, take one exaggerated step forward (approximately 1 meter) with the desired leg. 4. Land on the heel of the lead foot while pivoted off the ball of the trailing foot. 5. Keep the head up, chest out and hips forward. 6. Inhale while slowly flexing the lead leg, lower the trailing leg towards the ground. 7. The lead leg remains directly over the ankle with the shin perpendicular to the ground. 8. There should be no forward movement of the shin in this lead leg. 9. Pause once the knee of the trailing leg reaches 2-4 inches above the floor. 10. Exhaling, push off the forward leg until starting position is reached. 11. Repeat the process with the opposite leg. 12. Allow participant to try. 13. Correct movement: You're doing a great job of * positive feedback regarding technique* 14. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐
Plank	1. Last exercise! We're almost there. For this one we're going to focus on engaging our core muscle with an exercise known as the "plank." 2. Point to the muscle group. 3. The plank involves maintaining a difficult position for extended periods of time. The most common plank – which we will perform today – is the front plank which is held in a push-up position with the body's weight on the forearms, elbows, and toes. 4. To start: We're going to lay face down on the mat. 5. Next, prop your upper body up by placing your forearms on the mat, keeping your	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐

	elbows under your shoulders and your arms parallel to one another. 6. Place your legs shoulder width apart. 7. Raise your body upward until it is parallel with the ground. 8. Keep your head in a neutral position and toes curled under for support. 9. Try to pull your belly button towards your spine to engage your core muscles. 10. Hold position for 30 seconds. 11. Exercise can be made more challenging by increasing the time interval. 12. Allow participant to try. 13. Correct movement: You're doing a great job of * positive feedback regarding technique* 14. Incorrect movement: Try to *advice regarding technique*	6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐
Cool-Down	1. You've completed the weight-training portion. Now we're going to do a cool-down. The cool-down is important to help your breathing levels and heart rate return to normal. 2. To start: I will get you to just walk for approximately 5-10 minutes. 3. Similar to the warm up only at an easy/slow pace.	1. ☐ 2. ☐ 3. ☐
Flexibility Training	1. To finish off we're going to do some flexibility training. This is important to increase your body's range of motion and decrease the risk of injury. 2. I will lead you through a full-body stretch, targeting the major muscles worked today. 3. To start: We are going to sit on the mats, hinging at the hips, reaching out towards our toes, when you feel the stretch in your hamstrings (back of your leg) pause and hold for 20 seconds. 4. Continue stretches for: quadriceps, glutes, claves, core, lower back, triceps, biceps, chest, back, shoulders, and neck. 5. Correct movement: You're doing a great job of * positive feedback regarding technique* 6. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐
Closing Remarks	1. Great job we're all done! 2. Do you have any questions? 3. The researcher is going to give you a few more questionnaires to complete before you go home.	1. ☐ 2. ☐ 3. ☐

Item	**Mirror present with general feedback but no technique cues condition**	Checklist
Researcher: Trainer in back room	1. Greet participant, assign "ID" number 2. Informed consent 3. Demographic questionnaire 4. Baseline questionnaire 5. Trait Measures (SPAS) 6. Pre-test Questionnaire (S-SPA, SPE, TSE, Feeling States) 7. Introduce personal trainer once questionnaires are complete.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐
Introduction: Trainer Introduced	1. "Hi my name is Carly. 2. Shake hand "Nice to meet you (Participants Name)!" 3. I will be running your introductory weight training session today. I'm a master student in the Faculty of Applied Health Sciences. I am a CPTN certified personal trainer. 4. First we're going to perform a warm-up. Do you have any questions? 5. Are you ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Warm-Up	1. For the warm-up we will get you on the treadmill to start. 2. Demonstrate first then allow participant to try. 3. I will get you to warm-up for 10 minutes at 3.0 mph, just walking. 4. The purpose of a warm-up is to avoid injury and get your muscles ready for exercise. A good warm-up will cause a light sweat; you should be working at about 7 out of 10. A good way to judge this is if you can maintain a conversation while warming-up. 5. Following our warm-up we will start our introductory weight training session. Are you feeling warm? Ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Chest Press	1. Participants will be situated in the same corner of the room as the mirror cues + technique cues condition and mirror present + technique cues condition, to ensure they have the same opportunity to see themselves in the mirror. However, the trainer will not explicitly tell the participant to look in the mirror (e.g., "We are going to begin our orientation over here"). 2. For the weight training exercises I will show you the exercise first, then you may try 10 repetitions, and then I will help you with your form if needed.	1. ☐ 2. ☐

	3. You want to use a weight that allows you to remain control of the movement at all times. I can recommend a weight for you for each exercise and you can tell me if you need heavier or lighter. 4. First we will be performing a chest press. 5. This exercise targets our chest muscles. 6. Point to muscle group and show. 7. For this exercise we will be using a resistance band, wrapped around the stationary bicycle. 8. Using a resistance band is a great way to target the chest in a different way and change things up from the traditional press with dumbbells. 9. The band may make this exercise feel tougher, but you always have control over the level of tension by moving closer or further away from the center of the band. 10. To start: Holding one handle in each hand, face away from the bike, legs hip width apart with a slight bend in the knee. 11. Begin with your hands next to your chest and elbows out. Exhale and fully extend your arms. 12. Inhale and bring them back to 90-degrees. 13. Avoid locking the elbows 14. Allow participant to try. 15. Correct movement: Great job! Good work! You're doing great. 16. Incorrect movement: Great effort! You have amazing enthusiasm.	3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐
Bent Over Row	1. For our next exercise we will give our chest muscles a break and work our back. 2. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 3. Place your inside knee and hand on the bench, bending forward. 4. Demonstrate the exercise: with the dumbbell in the outside hand, keep the arm extended. 5. Exhale, and pull the dumbbell up towards the rib cage, keeping the elbow in. 6. The elbow should be higher than your back when you end the movement. 7. Pause, inhale and lower the dumbbell back down, fully extending the arm. 8. Allow participant to try.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐

	9. Correct movement: Great job! Good work! You're doing great. 10. Incorrect movement: Great effort! You have amazing enthusiasm.	9. ☐ 10. ☐
Bicep Curl	1. Next we will perform the bicep curl, which works the front of our arm here. 2. Point to biceps. 3. To start: Have feet shoulder width apart with a slight bend in your knees. 4. Keep the shoulders back and head up. 5. Grasp the bar with supinated grip (palms facing to the sky). Hands should be placed slightly wider than hip width. 6. Tuck your elbows into your sides. 7. While exhaling flex at the elbow and curl the bar towards the chest – pause and lower the bar back to the starting position while inhaling. 8. Allow participant to try. 9. Correct movement: Great job! Good work! You're doing great. 10. Incorrect movement: Great effort! You have amazing enthusiasm.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Triceps Kickback	1. It's good to work apposing muscles so since we just worked the biceps, we're going to counter it by working the triceps – the back of the arm. 2. Point to the muscle being worked 3. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 4. Place your inside knee and hand on the bench, bending forward. 5. Demonstrate the exercise: Grasp the dumbbell with the outside hand, keeping your elbow at a 90-degree angle, arm hugged into the rib cage. 6. Exhale and push the dumbbell back, keeping the upper arm stationary against the body, until the forearm is parallel with the body. 7. Contract the triceps at the end of the motion. 8. Pause, inhale and slowly bring the dumbbell back to the start position to complete one repetition. 9. Upon completion of the set we will repeat the exercise on the opposite arm. 10. Allow participant to try. 11. Correct movement: Great job! Good work! You're doing great.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐

	12. Incorrect movement: Great effort! You have amazing enthusiasm.	12. ☐
Lateral Dumbbell Raise	1. Alright we are halfway – great job so far! 2. This next exercise is going to work our deltoids. 3. Point to the muscles being worked. 4. To start: we're going to use the same stance as the last two exercises: feet shoulder width apart, knees slightly bent. 5. Grasp a dumbbell in each hand and hold them together in front of the body with the palms facing inward. 6. Keeping a slight bend in the elbows, exhale and raise the dumbbells directly out to the side until they're at shoulder level. 7. Pause at the top, inhale and slowly lower the dumbbells to the front of the body 8. Avoid swinging the movement. 9. Allow participant to try. 10. Correct movement: Great job! Good work! You're doing great. 11. Incorrect movement: Great effort! You have amazing enthusiasm.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐
Body-weight Squat	1. Now that your upper body is feeling pretty tired we can move to the lower body exercises. 2. For the next exercise we will just be using our body weight – it's a very effective exercise because it works several major muscle groups - quadriceps, hamstrings, glutes, and calves." 3. Point to muscles groups. 4. To start: feet are positioned side-by-side, approximately hip-width apart and directly under the shoulders. Toes pointed slightly outward 5. Keep your chest up and looking straight ahead 6. We are going to pretend like we are going to sit on a chair – begin the descent at the hips by pushing the buttocks backwards. 7. Inhale and lower until the thighs are parallel with the ground, keeping all the weight in the heels. 8. Make sure the knees remain behind the toes. 9. Pause slightly in the lowest position and exhale on the way up. 10. Allow participant to try.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐

	11. Correct movement: Great job! Good work! You're doing great. 12. Incorrect movement: Great effort! You have amazing enthusiasm.	11. ☐ 12. ☐
Lunge	1. Next we are going to focus on the muscles our lower body by performing the lunge. 2. To start: Stand erect, with feet approximately 6-12 inches apart. 3. With the toes pointed straight, take one exaggerated step forward (approximately 1 meter) with the desired leg. 4. Land on the heel of the lead foot while pivoted off the ball of the trailing foot. 5. Keep the head up, chest out and hips forward. 6. Inhale while slowly flexing the lead leg; lower the trailing leg towards the ground. 7. The lead leg remains directly over the ankle with the shin perpendicular to the ground. 8. There should be no forward movement of the shin in this lead leg. 9. Pause once the knee of the trailing leg reaches 2-4 inches above the floor. 10. Exhaling, push off the forward leg until starting position is reached. 11. Repeat the process with the opposite leg. 12. Allow participant to try. 13. Correct movement: Great job! Good work! You're doing great. 14. Incorrect movement: Great effort! You have amazing enthusiasm.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐
Plank	1. Last exercise! We're almost there. For this one we're going to focus on engaging our core muscle with an exercise known as the "plank." 2. Point to the muscle group. 3. The plank involves maintaining a difficult position for extended periods of time. The most common plank – which we will perform today – is the front plank which is held in a push-up position with the body's weight on the forearms, elbows, and toes. 4. To start: We're going to lay face down on the mat. 5. Next, prop your upper body up by placing your forearms on the mat, keeping your elbows under your shoulders and your arms parallel to one another. 6. Place your legs shoulder width apart. 7. Raise your body upward until it is parallel with the ground.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐

	8. Keep your head in a neutral position and toes curled under for support. 9. Try to pull your belly button towards your spine to engage your core muscles. 10. Hold position for 30 seconds. 11. Exercise can be made more challenging by increasing the time interval. 12. Allow participant to try. 13. Correct movement: Great job! Good work! You're doing great. 14. Incorrect movement: Great effort! You have amazing enthusiasm.	8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐
Cool-Down	1. You've completed the weight-training portion. Now we're going to do a cool-down. The cool-down is important to help your breathing levels and heart rate return to normal. 2. To start: I will get you to just walk for approximately 5-10 minutes. 3. Similar to the warm up only at an easy/slow pace.	1. ☐ 2. ☐ 3. ☐
Flexibility Training	1. To finish off we're going to do some flexibility training. This is important to increase your body's range of motion and decrease the risk of injury. 2. I will lead you through a full-body stretch, targeting the major muscles worked today. 3. To start: We are going to sit on the mats, hinging at the hips, reaching out towards our toes, when you feel the stretch in your hamstrings (back of your leg) pause and hold for 20 seconds. 4. Continue stretches for: quadriceps, glutes, claves, core, lower back, triceps, biceps, chest, back, shoulders, and neck. 5. Correct movement: Great job! Good work! You're doing great. 6. Incorrect movement: Great effort! You have amazing enthusiasm.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐
Closing Remarks	1. Great job we're all done! 2. Do you have any questions? 3. The researcher is going to give you a few more questionnaires to complete before you go home.	1. ☐ 2. ☐ 3. ☐

Item	**No mirror present with technique cues condition**	Checklist
Researcher: Trainer in back room	1. Greet participant, assign "ID" number 2. Informed consent 3. Demographic questionnaire 4. Baseline questionnaire 5. Trait Measures (SPAS) 6. Pre-test Questionnaire (S-SPA, SPE, TSE, Feeling States) 7. Introduce personal trainer once questionnaires are complete.	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐
Introduction: Trainer Introduced	1. "Hi my name is Carly. 2. Shake hand "Nice to meet you (Participants Name)!" 3. I will be running your introductory weight training session today. I'm a master student in the Faculty of Applied Health Sciences. I am a CPTN certified personal trainer. 4. First we're going to perform a warm-up. Do you have any questions? 5. Are you ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Warm-Up	1. For the warm-up we will get you on the treadmill to start. 2. Demonstrate first then allow participant to try. 3. I will get you to warm-up for 10 minutes at 3.0 mph, just walking. 4. The purpose of a warm-up is to avoid injury and get your muscles ready for exercise. A good warm-up will cause a light sweat; you should be working at about 7 out of 10. A good way to judge this is if you can maintain a conversation while warming-up. 5. Following our warm-up we will start our introductory weight training session. Are you feeling warm? Ready to get started?	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐
Chest Press	1. In this condition, curtains will cover all mirrors. *Participants will be positioned away from the covered mirrors to avoid any focus on the mirrored environment. 2. For the weight training exercises I will show you the exercise first, then you may try 10 repetitions, and then I will help you with your form if needed. 3. You want to use a weight that allows you to remain control of the movement at all times. I can recommend a weight for you for each exercise and you can tell me if you need heavier or lighter. 4. First we will be performing a chest press.	1. ☐ 2. ☐ 3. ☐ 4. ☐

	5. This exercise targets our chest muscles. 6. Point to muscle group and show. 7. For this exercise we will be using a resistance band, wrapped around the stationary bicycle. 8. Using a resistance band is a great way to target the chest in a different way and change things up from the traditional press with dumbbells. 9. The band may make this exercise feel tougher, but you always have control over the level of tension by moving closer or further away from the center of the band. 10. To start: Holding one handle in each hand, face away from the bike, legs hip width apart with a slight bend in the knee. 11. Begin with your hands next to your chest and elbows out. Exhale and fully extend your arms. 12. Inhale and bring them back to 90-degrees. 13. Avoid locking the elbows 14. Allow participant to try. 15. Correct movement: You're doing a great job of * positive feedback regarding technique* 16. Incorrect movement: Try to *advice regarding technique*	5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐ 15. ☐ 16. ☐
Bent Over Row	1. For our next exercise we will give our chest muscles a break and work our back. 2. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 3. Place your inside knee and hand on the bench, bending forward. 4. Demonstrate the exercise: with the dumbbell in the outside hand, keep the arm extended. 5. Exhale, and pull the dumbbell up towards the rib cage, keeping the elbow in. 6. The elbow should be higher than your back when you end the movement. 7. Pause, inhale and lower the dumbbell back down, fully extending the arm. 8. Allow participant to try. 9. Correct movement: You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Bicep Curl	1. Next we will perform the bicep curl, which works the front of our arm here. 2. Point to biceps.	1. ☐ 2. ☐

	3. To start: Have feet shoulder width apart with a slight bend in your knees. 4. Keep the shoulders back and head up. 5. Grasp the bar with supinated grip (palms facing to the sky). Hands should be placed slightly wider than hip width. 6. Tuck your elbows into your sides. 7. While exhaling flex at the elbow and curl the bar towards the chest – pause and lower the bar back to the starting position while inhaling. 8. Allow participant to try. 9. Correct movement: You're doing a great job of * positive feedback regarding technique* 10. Incorrect movement: Try to *advice regarding technique*	3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐
Triceps Kickback	1. It's good to work apposing muscles so since we just worked the biceps, we're going to counter it by working the triceps – the back of the arm. 2. Point to the muscle being worked 3. Explain the exercise: place the dumbbell next to the bench, standing on that same side. 4. Place your inside knee and hand on the bench, bending forward. 5. Demonstrate the exercise: Grasp the dumbbell with the outside hand, keeping your elbow at a 90-degree angle, arm hugged into the rib cage. 6. Exhale and push the dumbbell back, keeping the upper arm stationary against the body, until the forearm is parallel with the body. 7. Contract the triceps at the end of the motion. 8. Pause, inhale and slowly bring the dumbbell back to the start position to complete one repetition. 9. Upon completion of the set we will repeat the exercise on the opposite arm. 10. Allow participant to try. 11. Correct movement: You're doing a great job of * positive feedback regarding technique* 12. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐
Lateral Dumbbell Raise	1. Alright we are halfway – great job so far! 2. This next exercise is going to work our deltoids. 3. Point to the muscles being worked. 4. To start: we're going to use the same stance as the last two exercises: feet shoulder width apart, knees slightly bent.	1. ☐ 2. ☐ 3. ☐ 4. ☐

	5. Grasp a dumbbell in each hand and hold them together in front of the body with the palms facing inward. 6. Keeping a slight bend in the elbows, exhale and raise the dumbbells directly out to the side until they're at shoulder level. 7. Pause at the top, inhale and slowly lower the dumbbells to the front of the body 8. Avoid swinging the movement. 9. Allow participant to try. 10. Correct movement: You're doing a great job of * positive feedback regarding technique* 11. Incorrect movement: Try to *advice regarding technique*	5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐
Body-weight Squat	1. Now that your upper body is feeling pretty tired we can move to the lower body exercises. 2. For the next exercise we will just be using our body weight – it's a very effective exercise because it works several major muscle groups - quadriceps, hamstrings, glutes, and calves." 3. Point to muscles groups. 4. To start: feet are positioned side-by-side, approximately hip-width apart and directly under the shoulders. Toes pointed slightly outward 5. Keep your chest up and looking straight ahead 6. We are going to pretend like we are going to sit on a chair – begin the descent at the hips by pushing the buttocks backwards. 7. Inhale and lower until the thighs are parallel with the ground, keeping all the weight in the heels. 8. Make sure the knees remain behind the toes. 9. Pause slightly in the lowest position and exhale on the way up. 10. Allow participant to try. 11. Correct movement: You're doing a great job of * positive feedback regarding technique* 12. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐
Lunge	1. Next we are going to focus on the muscles our lower body by performing the lunge. 2. To start: Stand erect, with feet approximately 6-12 inches apart. 3. With the toes pointed straight, take one exaggerated step forward (approximately 1 meter) with the desired leg.	1. ☐ 2. ☐ 3. ☐

	4. Land on the heel of the lead foot while pivoted off the ball of the trailing foot. 5. Keep the head up, chest out and hips forward. 6. Inhale while slowly flexing the lead leg, lower the trailing leg towards the ground. 7. The lead leg remains directly over the ankle with the shin perpendicular to the ground. 8. There should be no forward movement of the shin in this lead leg. 9. Pause once the knee of the trailing leg reaches 2-4 inches above the floor. 10. Exhaling, push off the forward leg until starting position is reached. 11. Repeat the process with the opposite leg. 12. Allow participant to try. 13. Correct movement: You're doing a great job of * positive feedback regarding technique* 14. Incorrect movement: Try to *advice regarding technique*	4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐
Plank	1. Last exercise! We're almost there. For this one we're going to focus on engaging our core muscle with an exercise known as the "plank." 2. Point to the muscle group. 3. The plank involves maintaining a static position for extended periods of time. The most common plank – which we will perform today – is the front plank which is held in a push-up position with the body's weight on the forearms, elbows, and toes. 4. To start: We're going to lay face down on the mat. 5. Next, prop your upper body up by placing your forearms on the mat, keeping your elbows under your shoulders and your arms parallel to one another. 6. Place your legs shoulder width apart. 7. Raise your body upward until it is parallel with the ground. 8. Keep your head in a neutral position and toes curled under for support. 9. Try to pull your belly button towards your spine to engage your core muscles. 10. Hold position for 30 seconds. 11. Exercise can be made more challenging by increasing the time interval. 12. Allow participant to try. 13. Correct movement: You're doing a great job of * positive feedback regarding technique* 14. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐ 7. ☐ 8. ☐ 9. ☐ 10. ☐ 11. ☐ 12. ☐ 13. ☐ 14. ☐

Cool-Down	1. You've completed the weight-training portion. Now we're going to do a cool-down. The cool-down is important to help your breathing levels and heart rate return to normal. 2. To start: I will get you to just walk for approximately 5-10 minutes. 3. Similar to the warm up only at an easy/slow pace.	1. ☐ 2. ☐ 3. ☐
Flexibility Training	1. To finish off we're going to do some flexibility training. This is important to increase your body's range of motion and decrease the risk of injury. 2. I will lead you through a full-body stretch, targeting the major muscles worked today. 3. To start: We are going to sit on the mats, hinging at the hips, reaching out towards our toes, when you feel the stretch in your hamstrings (back of your leg) pause and hold for 20 seconds. 4. Continue stretches for: quadriceps, glutes, claves, core, lower back, triceps, biceps, chest, back, shoulders, and neck. 5. Correct movement: You're doing a great job of * positive feedback regarding technique* 6. Incorrect movement: Try to *advice regarding technique*	1. ☐ 2. ☐ 3. ☐ 4. ☐ 5. ☐ 6. ☐
Closing Remarks	1. Great job we're all done! 2. Do you have any questions? 3. The researcher is going to give you a few more questionnaires to complete before you go home.	1. ☐ 2. ☐ 3. ☐